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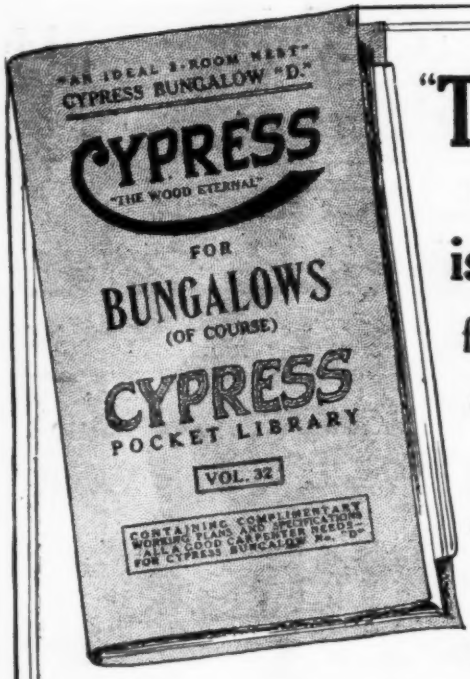

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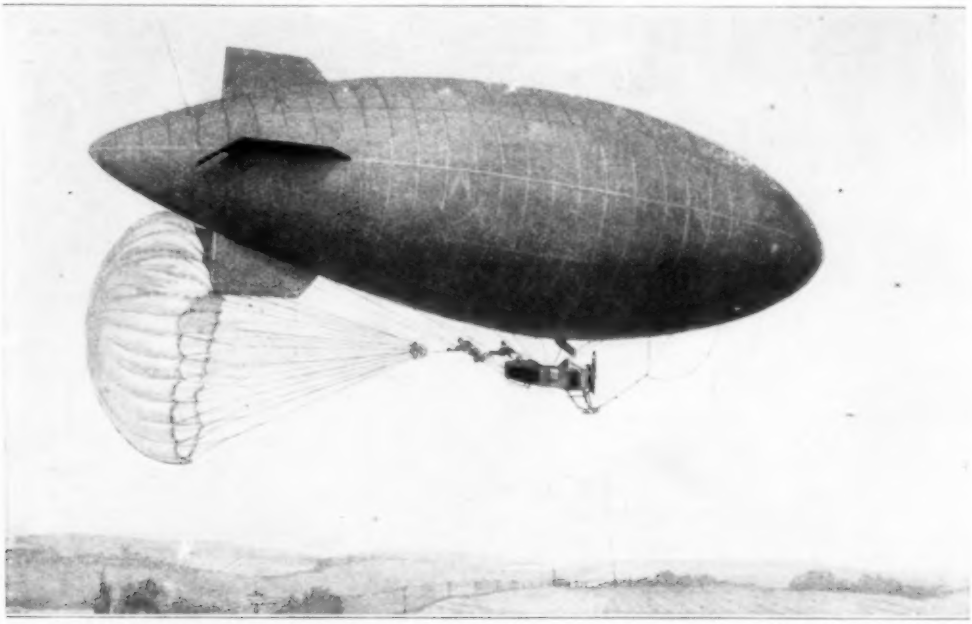
Vol. 36 JULY, 1921 No. 1

Thrilling Runaway-Parachute Accident

WHILE the parachute is to the airman what the life belt is to the mariner, that it may cause the death of the user is demonstrated forcibly by two dramatic accidents which have taken place recently. The latest, and perhaps the most spectacular of these, happened a short time ago at one of the Pacific-coast flying fields, when the string of the parachute container became unfastened and allowed Pilot George Hockensmith's parachute to drop out and into the powerful draft of the propeller of the "blimp" in which he was riding. Instantly, and before he had any warning of the mishap, the canvas filled and, jerking the luckless airman from the cockpit, hurled him with terrific force into the steel-cable rigging, where he became helplessly wedged. Then began a battle for life.

With the big apparatus dragging on his body harness with a force of scores of pounds, threatening to crush in his ribs, the desperate man, by a tremendous effort, succeeded in freeing himself of the entangling cordage of the ship and was about to drop when a sudden shifting of the wind drove the parachute against the blimp's rudder, fouling its ropes and making an attempt to jump nothing short of suicidal. One more chance remained to the now nearly exhausted pilot: that of cutting the parachute ropes. Opening his knife with difficulty, he made one futile slash at the tugging line, but his nerveless fingers, refusing to respond to the dictates of his will, failed him and, opening, allowed the knife to fall.

In the meantime his companion, Fred Campbell, had discovered the flier's plight and, stopping the engine, thus lessening the parachute's terrific pull somewhat, showed no hesitation in risking his life in a daring attempt at rescue. Leaving the



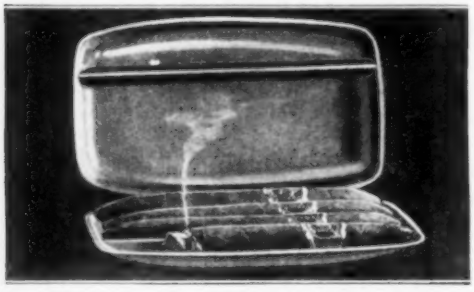
Had the Runaway Parachute Not Fouled the Blimp's Rudder the Airman might have Trusted to a Leap for Life. The Above View Shows His Companion Going to the Helpless Flier's Assistance. Cutting the Parachute Adrift, His Fearless Team Mate Lifted the Exhausted Pilot Back to the Safety of the Cockpit

gondola he crawled outward and upward along the slender cables, until, coming within reach of the parachute cord, he severed it with one cut, relieving the badly mauled pilot of the crushing strain.

Then began a no less hazardous undertaking; that of assisting the unnerved man back to the safety of the cockpit. This was finally accomplished and, after a brief rest, the fliers started the engine and returned to the flying field no worse off for their thrilling experience than painfully bruised bodies and badly jangled nerves.

NEW HOLDER CARRIES BURNING CIGAR

The "no smoking allowed" sign often catches the smoker unawares, and he invariably seeks a handy ledge or window sill on which to hide the "smoke" that



The New Cigar Holder Has a Separate Insulated Compartment for Holding a Burning Cigar. Here It is Kept Sanitary for Later Indulgence

just begins to taste good. Here the cigar is exposed to dirt and germs, making subsequent indulgence hazardous, or at least distasteful. In order to preserve the last pleasurable puffs in a sanitary manner, he may now inclose his lighted cigar in a case made for the purpose. This case has two compartments, one for the lighted cigar and a second for a supply of fresh smokes. The first compartment is insulated for protection against fire and heat radiation, and is separated from the second compartment by abutting inner fittings.

AIRMAN LAYS LAND CABLE IN EIGHT MINUTES

Six miles of land telegraph cable was successfully laid in Sweden recently by the use of an airplane. Of the eight minutes' time required, six were spent in flight and the other two in making connections. Military men see great future possibilities for this method both in military and commercial service. The cable was unreeled from the machine in flight with a flag marker at one end on the ground to guide signalmen to it. When the six-mile stretch had been covered, the wire was cut free, weighted, and dropped to the ground. The man waiting below had merely to pick it up and make connections.

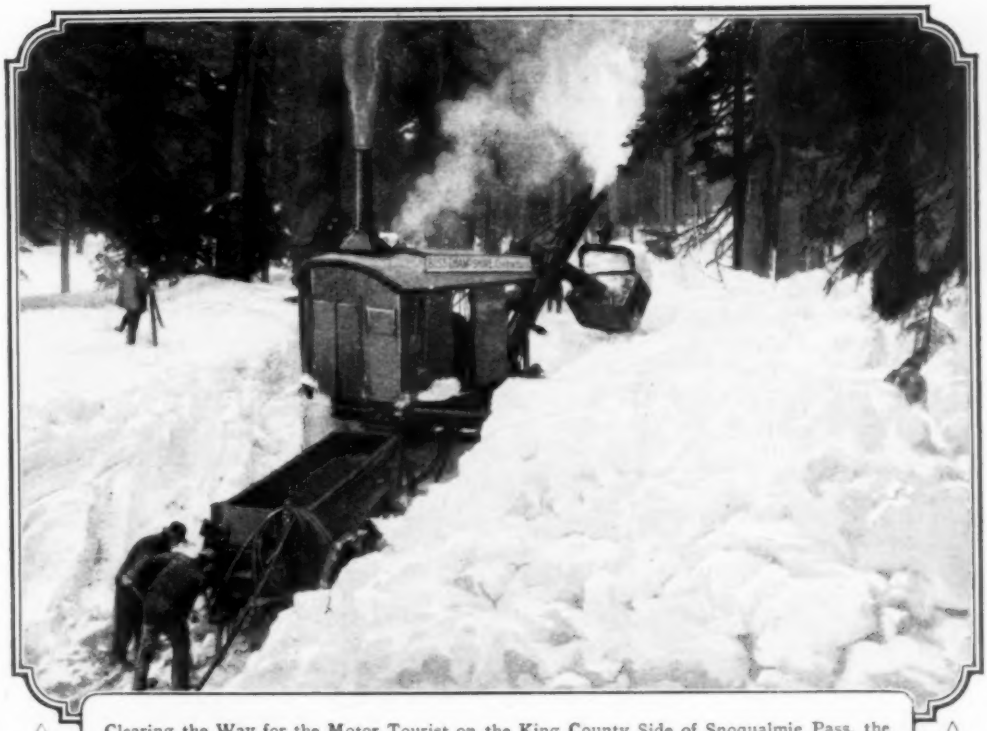
OPENING SNOQUALMIE PASS WITH STEAM

By LAWRENCE WILLIAM PEDROSE

EVERY spring King Frost's control of Snoqualmie Pass, on the Sunset Highway where it crosses the Cascade Mountains, has to be broken to permit motor-car traffic. In former years horse teams were put to work in April, and the pass generally opened by the first week in May. About three miles of the snow-bound area lies in King County, and five miles in Kittitas County, Washington, or a total of about 42,000 lineal feet.

This year, for the first time, a steam shovel was used to remove the snow in the pass. Although snowfalls occurred later than usual and opening the pass this year meant conquering other obstacles, the innovation was successful. Some idea of the amount of work done may be gleaned from the fact that the snow averaged more than 8 ft. in depth. A roadway 12 ft. wide was cut, necessitating the removal of more than 140,000 cu. yd. of snow.

The procuring of fuel was no small task. The snow was so deep that bark or firewood could not be obtained along the right of way, so coal was hauled in wagons along the cleared road. Melted snow water was used in the boiler, obtained by pumping from rivulets along the road. The steam shovel functioned efficiently and with a minimum amount of labor. Scooping up the snow and depositing it off the right of way proved much simpler than removing it with block and line and horse-team scrapers. Under favorable conditions, it was estimated, the pass could be cleared by the new method with 50 per cent less physical effort than by the old.

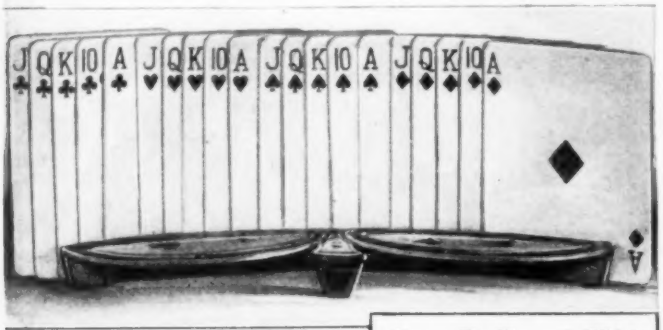


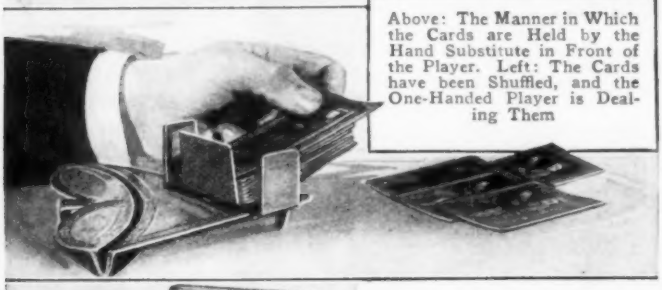
Clearing the Way for the Motor Tourist on the King County Side of Snoqualmie Pass, the Sunset Highway Crossing of the Cascade Mountains: The Advantage of the Steam Shovel over Horse Teams with Scrapers and Block and Line will be Readily Seen

The Mogul Shoved Her Nose Forward and Scooped Up the Snow in Half-Ton Bites, Depositing off the Side of the Right of Way with a Minimum of Effort. About Eight Miles of Highway were Satisfactorily Cleared by This Method

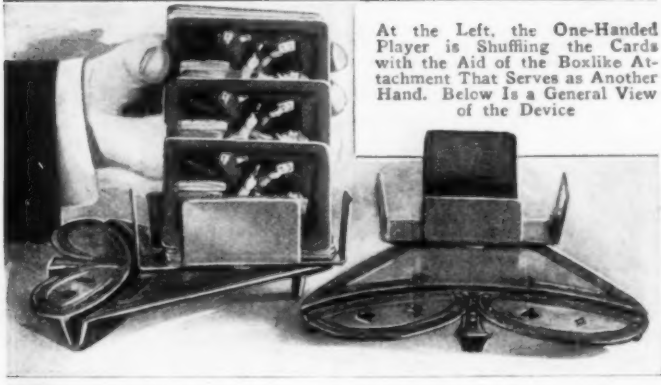
CLEVER HAND SUBSTITUTE AIDS ONE-HANDED CARD PLAYERS

It takes two human hands to play one hand at cards adroitly. To shuffle, or deal, with one hand is practically impossible, and so all one-handed card players will welcome a substitute for the missing hand. It is in the form of a light and ornamental aluminum baseplate, triangular in shape. Along the base of the triangle is a curved slot in which the cards are placed, one behind the other, so as to hold them vertically in front of the player, in exactly the same way as a two-handed player holds them. In front of this curved slot is swiveled a boxlike attachment shaped to hold a deck of cards, with the top and one side of the box open. This affords the one-handed player the same advantage as a second hand in holding the cards, when shuffling or dealing. The machine weighs only ½ lb., and measures 8 in. across the base of the triangle, so that it is conveniently carried.





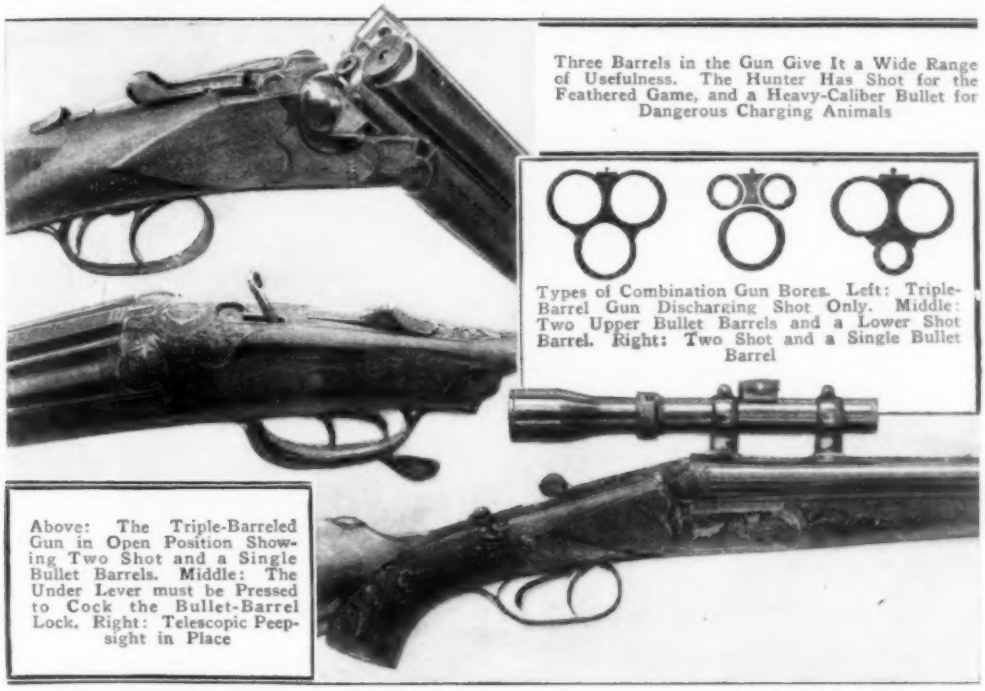
Above: The Manner in Which the Cards are Held by the Hand Substitute in Front of the Player. Left: The Cards have been Shuffled, and the One-Handed Player is Dealing Them



At the Left, the One-Handed Player is Shuffling the Cards with the Aid of the Boxlike Attachment That Serves as Another Hand. Below Is a General View of the Device

INDUSTRIAL USE OF X-RAYS PRESENTS NEW PROBLEMS

So new is the miracle of the X-ray that most persons are quite apt to overrate its diversified possibilities, and attribute to it powers, which up to the present it has not been found to possess. For instance, it is not true that it will penetrate great thicknesses of steel, brick, cement, wood, or other common materials, but, on the contrary, it is almost completely absorbed by steel over 3 in. thick and by comparatively thin sections of the other materials named. By the foregoing is meant penetrations that are of service in photographic or fluorescent-screen observations in detecting defects in steel rails, beams, and in the sundry building materials. It is quite true, that by using an extremely penetrating ray of an exceedingly short wave length generated by voltages exceeding 150,000, greater thicknesses are readily penetrated, but, in this case, secondary rays are caused to be given off by the material under observation which obliterate all contrasts and result in a "fogging" of the photographic plate. Up to the present, a tube voltage of 120,000 to 150,000 has been found to be the practicable limit. A recent advance in X-ray-plate development has been the coating of them with calcium tungstate, which has the property of fluorescing, or converting X-rays into true light rays that are easily registered by the plates, the intensifying action resulting in greater speed and sharper definition and contrasts.



Three Barrels in the Gun Give It a Wide Range of Usefulness. The Hunter Has Shot for the Feathered Game, and a Heavy-Caliber Bullet for Dangerous Charging Animals

Types of Combination Gun Bores. Left: Triple-Barrel Gun Discharging Shot Only. Middle: Two Upper Bullet Barrels and a Lower Shot Barrel. Right: Two Shot and a Single Bullet Barrel

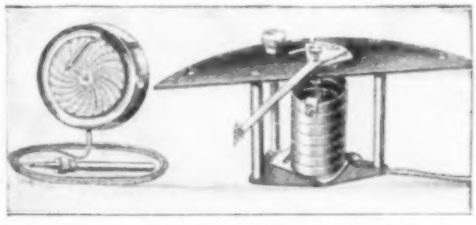
Above: The Triple-Barreled Gun in Open Position Showing Two Shot and a Single Bullet Barrels. Middle: The Under Lever must be Pressed to Cock the Bullet-Barrel Lock. Right: Telescopic Peep-sight in Place

TRIPLE-BARRELED GUN SHOOTS SOLID BULLET FROM ONE TUBE

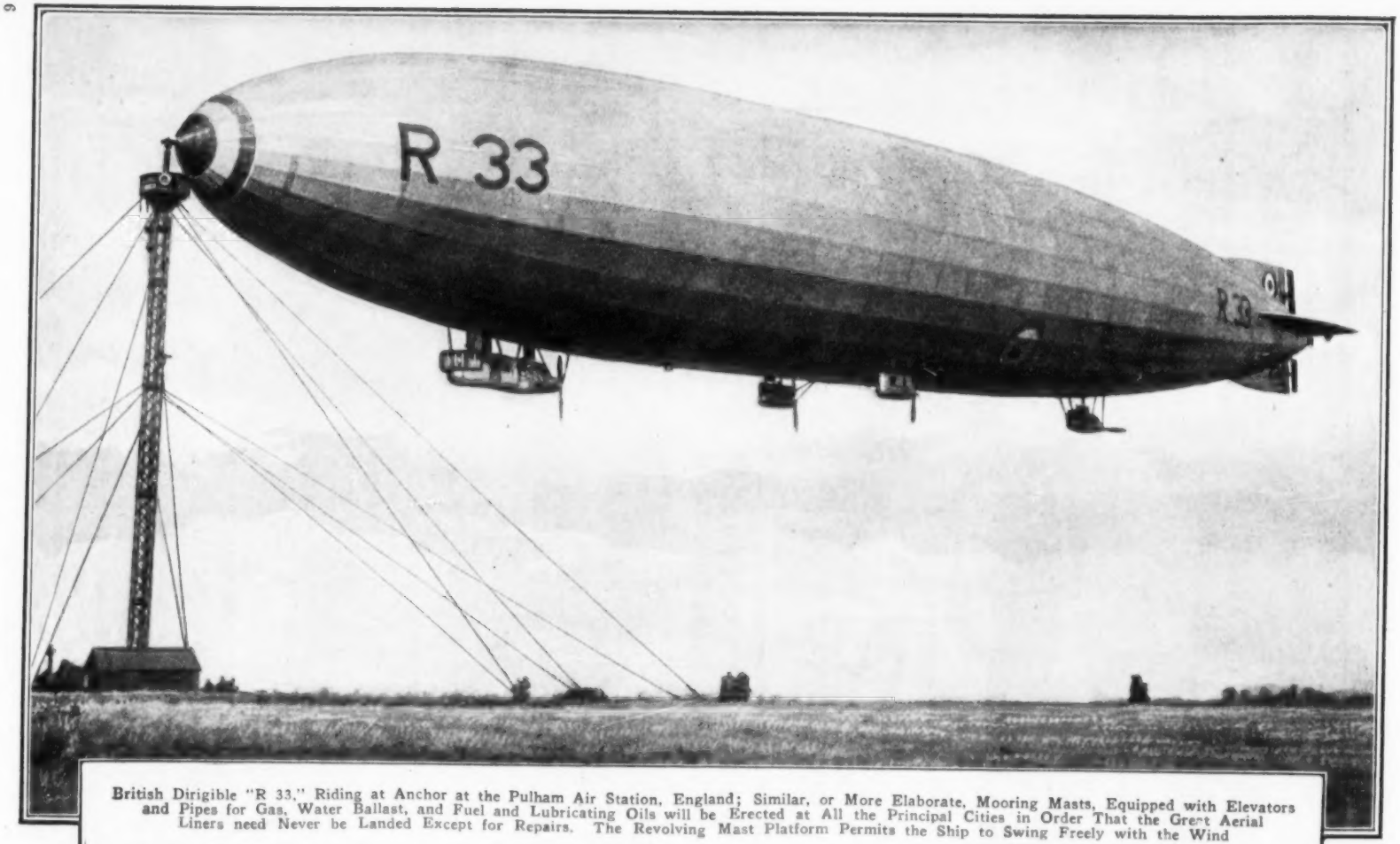
Hunters in the pursuit of their favorite sport often face exasperating circumstances. Either they come upon a bevy of feathered game with only a rifle at hand or they meet a big or dangerous animal when their firearm is a shotgun. In both cases they are at a decided disadvantage, and for their convenience in such events, a triple-barreled gun has been devised. Two of the barrels of this gun fire shot, while the third is used to eject heavy-caliber rifle bullets. A special lever by which the rifle barrel may be thrown into use makes the combination a ready defense in almost any of the emergencies encountered in hunting. Earlier designs of the triple-barreled gun were of foreign origin and with the rifle barrel differently placed, but its location under the two shot barrels is considered an improvement.

NEW RECORDING THERMOMETER WORKS AT LONG DISTANCE

In many kinds of industrial work it is necessary to be able to record temperatures accurately on a thermometer situated at considerable distances from the source of heat. An instrument of this nature has been produced in which records can be made at distances up to 150 ft. In general appearance it resembles other recording thermometers, but it has a novel mechanism for actuating the recording pen. This consists essentially of a helically wound tube of the nature of the tube that operates a Bourdon gauge, as is well known, by a distortion of the tube caused by a change of pressure. In the thermometer, the same effect results from a change in temperature. The blind end of the tube is connected to the recording pen, which is pivoted in such a manner that the small movement of this connected end is multiplied several times in a corresponding movement at the pen end, which thus moves in an arc across the recording chart so as to intersect circular graduations that indicate the temperature. The pen is adjustable by means of a knob, and in this manner the instrument can be recalibrated at any time by setting it to agree with a known temperature.



Left: The Thermometer with Its Connecting Tube. Right: The Recording Pen and Tube That Operates It



British Dirigible "R 33," Riding at Anchor at the Pulham Air Station, England; Similar, or More Elaborate, Mooring Masts, Equipped with Elevators and Pipes for Gas, Water Ballast, and Fuel and Lubricating Oils will be Erected at All the Principal Cities in Order That the Great Aerial Liners need Never be Landed Except for Repairs. The Revolving Mast Platform Permits the Ship to Swing Freely with the Wind

THE WORLD PHOTOS

"DOCKING" A GIANT DIRIGIBLE AT AN AERIAL PORT

The steel latticework dirigible-mooring mast has reached such a stage of development that "docking" one of the giant airships is very like warping an ocean liner into its wharf. Towering 115 ft., the fragile-appearing mast, built for toughness and strength rather than rigidity, is fitted at the top with a revolving platform, a concave conical recess for the nose of the ship, strong steel mooring clamps, and a system of cables and winches.

When a dirigible is sighted, the platform is turned so that the nose fitting points down wind. A 600-ft. steel cable, running over pulleys and through the nosepiece, is then drawn out in the same direction, ready to be attached to another dropped by the ship's crew. Immediately this is done, the signal "haul down" is given and the winches, reeling in the cable, gently draw the unwieldy craft to its resting place. The cables are not trusted to hold the ship, but after the nose is drawn snugly into the conical fitting, the mooring clamps are applied. Not only is the tower platform free to revolve, but it is also mounted in such a way on gimbal bearings that it rocks easily at all angles. This permits the great craft to respond to every vagary of the wind without being subjected to racking strains.

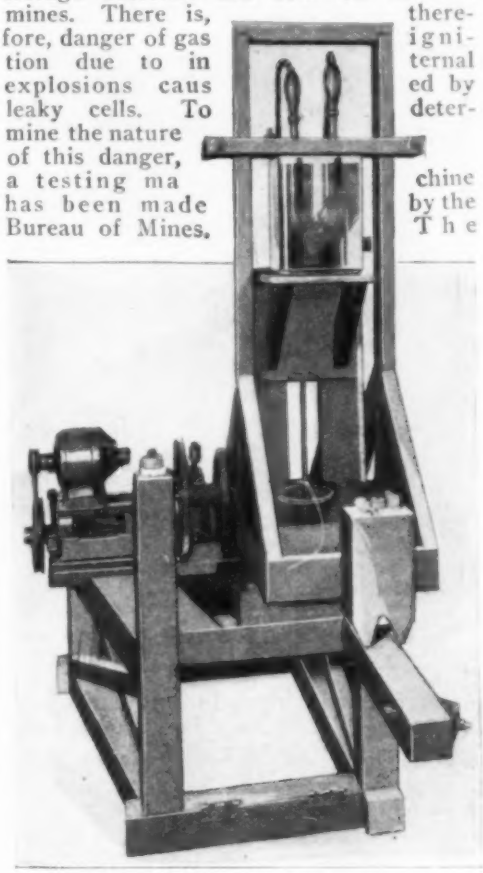
While the actual landing and housing of a dirigible requires a crew of 300 to 400 men, only six are needed in the mooring operation.

VIRILE PENNYWORT CLASSED AMONG WEEDS

Because of its aggressiveness and hardiness, as well as its tendency to crowd out desirable grass varieties, the once cultivated lawn pennywort, imported from Asia years ago, is now the subject of much experimentation with a view to its eradication. Golf grounds and grassy plots in some parts of Kentucky, the District of Columbia, and around Philadelphia, are practically covered by the pest. Spraying with solutions of common salt, arsenic or iron sulphate, and with plain gasoline, has been found to burn the leaves but to leave the stems practically unharmed. These quickly sprout again. Its spreading is, in part, attributed to the fact that pedestrians pick up the projecting seedpods with their heels and drop the seeds about.

TESTS OF STORAGE BATTERIES USED ON MINE LOCOMOTIVES

Electrically driven locomotives using storage batteries are common in coal mines. There is, therefore, danger of gas ignition due to internal explosions caused by leaky cells. To determine the nature of this danger, a testing machine has been made by the Bureau of Mines. The

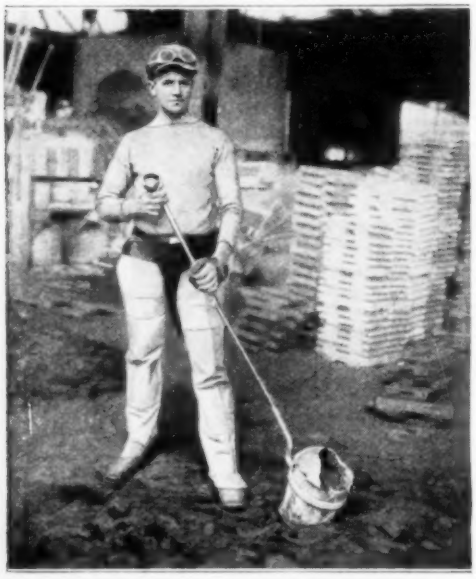


On a Shelf That Slides Up and Down in the Frame Is the Glass Jar Full of Electrolyte Connected with the Storage Cell under Investigation

storage cell under investigation is fastened to a support by the side of an upright frame, in which a platform is caused to slide up and down between vertical guides, by means of a train of gears driven by a connecting motor. On this platform is secured a glass jar full of electrolyte. By this means the electrolyte is drained through the bottom of the cell under test at any desired rate. Sixty-nine tests were made with discharging cells, the circuit remaining closed after the electrolyte had been drained away. Twenty explosions occurred, or about 30 per cent of the tests, and the conclusion drawn is that there is necessity for taking precautions to guard against low electrolyte.

HIP-LENGTH CANVAS LEGGINGS PROTECT FOUNDRYMEN

Because of their nearness to pouring molten metal, the legs of foundrymen are subject to intense heat. Metal splashes



This Hip-Length Canvas Legging is Used by Foundrymen for Protection against Intense Heat While Pouring Molten Metal

also occur at times, and to prevent injury from these causes, a hip-length canvas legging is used. This legging differs from the knee-length styles commonly in use, in that it has no steel stays to retain the heat. It also has the advantage of being loose, leaving a jacket of air between the leg and the legging. There is no take-up at the knee to cause wrinkles that would form a good pocket for catching and retaining splashing metal.

LINE-CARRYING BUOY SERVES ALSO AS LIFE PRESERVER

A buoy, capable of carrying a line for considerable distances from a ship, was successfully tested recently, off Rockaway, N. Y. The buoy is in the form of a floating water-tight cylinder, in which is mounted a reel wound with a long line, that passes from the buoy and remains connected to the ship. When the buoy drifts from the ship this line is unwound, and there is a permanent connection between the buoy and the ship. A line-carrying buoy of this description has many uses. In the case of a ship aground in a storm, the buoy would carry a line to the shore, to be connected to a breeches-buoy line, which could then be hauled aboard, and used for rescuing the crew. In case of a total wreck at sea, it can be used for saving the ship's papers and valuables. Rope handles are attached to it, and it has sufficient buoyancy to support five or six persons in the manner of a life preserver.

Left: The Buoy with the Top Removed and Lying on the Deck beside It. The Reel Wound with a Line can be Seen Inside. Above: The Buoy is being Thrown over the Stern of the Ship to Which the Line has been Attached. The Buoy will Remain Where It Falls, and the Line will be Unwound as the Ship Drifts Away from It

BLOOD VIBRATIONS DETERMINE PARENTAGE

Court Decision Based on Mechanical Tests of Blood Establishes Precedent. Rate of Vibration of Electrons Always Agrees in Father and Child

By ALBERT ABRAMS, A. M., M. D., LL. D.

RECENTLY Paul Vittori, of San Francisco, denied the parentage of his daughter. A few drops of blood taken from Vittori and the child demonstrated that Vittori was the father.

These blood findings were accepted as conclusive by Superior Judge Thomas F. Graham. Heretofore, the accepted medicolegal tests for blood identification were limited to a differentiation of human and animal blood. This is done microscopically by determining the dimensions of the red corpuscles. Unfortunately this method is practically valueless, owing to the shrinkage of the corpuscles in drying and their swelling when the test fluids are used. It is possible, however, to recognize the oval and nucleated red corpuscles of avian and reptilian blood.

The latest method now used is the so-called "precipitin reaction." All this test actually accomplishes is to differentiate human from animal blood, but even then there are many sources of error connected with the method. With a few drops of blood, the "electronic tests of Abrams" permit one to determine, among other data, the following:

1—Approximate age;

2—Sex;

3—Race;

4—Parental inheritance of disease;

5—Vibratory rate (this always corresponds with that of the father);

6—Differentiation of human from animal blood. Only the Primates (apes, etc.) show the same vibratory rate as human blood, and only the blood of the negro is racially identical with that of the Primates;

7—If the blood is that of a female, one can approximately determine the number of children and their sex.

For many years the writer in his various works attempted to show the necessity of applying the electronic theory to biological phenomena. The ultimate constituents of matter are electrons, or charges of electricity, and radioactivity is dependent on ethereal disturbances by a change in motion of the electrons. All the cosmic forces are comprehended in a single word—energy.

Every phenomenon in nature is merely a question of a definite kind of motion or vibration. All electrons are characterized by the uniformity of their vibrations. This is evident in the sharpness of the lines making up the spectrum of an element. The recognition and application of two fundamental laws led to the construction of the oscillophore:

1—Electromagnetic waves have no effect on objects which are incapable of vibrating in resonance with them. Such objects are transparent to the particular wave length in question. Thus, rock salt is transparent to heat and ultraviolet rays, and ruby glass to red light waves.

2—In the interference of sound, two sound waves are capable of uniting to reinforce each other, or they may be so united as to interfere with or destroy each other. In other words, under the proper condition, the union of two sounds can produce silence.

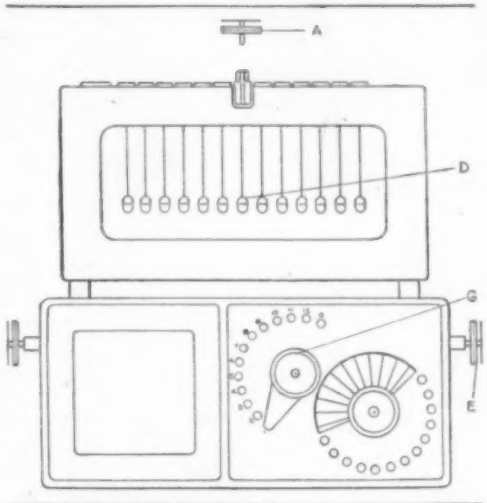


Diagram of Oscillophore: A Drop of the Supposed Father's Blood was Placed on the Condensing Electrode A, and a Drop of the Daughter's on the Condenser E. By Electromagnetic Action the Vibratory Energy of the Blood at A was Condensed in the Capsule D, Which was Kept Rhythmically Swinging by Means of a Metronome. This Swinging was Periodically Stopped by the Influence of the Blood at E. The Effect was Accepted as Proof of Parentage

The action of energy is qualitative rather than quantitative. A tuning fork unresponsive to the most violent explosion will vibrate to an imperceptible sound. No force, however tremendous, can modify the molecular orientation of the electrons in steel, yet the action of a magnet will at once make it magnetic.

As its name suggests, the oscillophore is an apparatus for carrying vibrations of radioactive energy. It was originally designed for the differentiation of radio-

active energies from the blood in different diseases, and is still employed almost exclusively for this purpose.

Referring to the illustration, there are six suspended capsules on either side of a central capsule, D. The others may be disregarded for our purpose. This central capsule is delicately suspended and is constructed on the principle of a condenser, and if a specimen of blood is placed on the condensing electrode A, its radioactive energy is condensed in D.

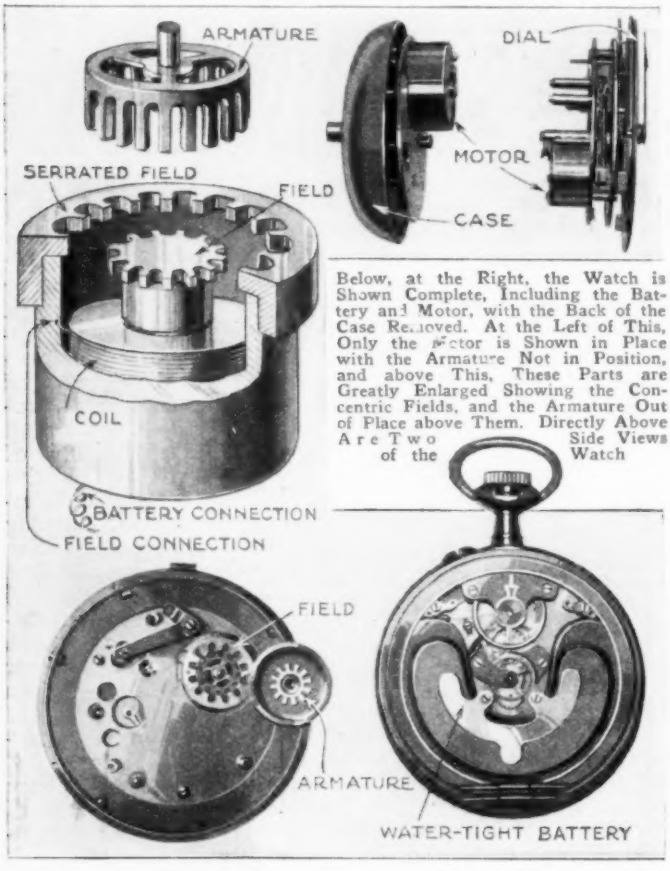
A gentle swing is communicated to D and maintained by the action of a metronome. Now, if blood of a like vibratory rate is placed at the condensing electrode E, the movement of D is arrested—as a rule, within 20 seconds—for about a second, and its oscillations are renewed, to be again arrested at half-minute intervals.

It has been found after thousands of examinations that only blood of a like vibratory rate will thus arrest the movements of D. It has also been found that the different numbers on the scale of a specially constructed rheostat, G, will allow only radioactive energy of different wave lengths to act on D. These wave lengths differ in animal and human blood, in different races, and in the two sexes. After this manner differentiation is possible.

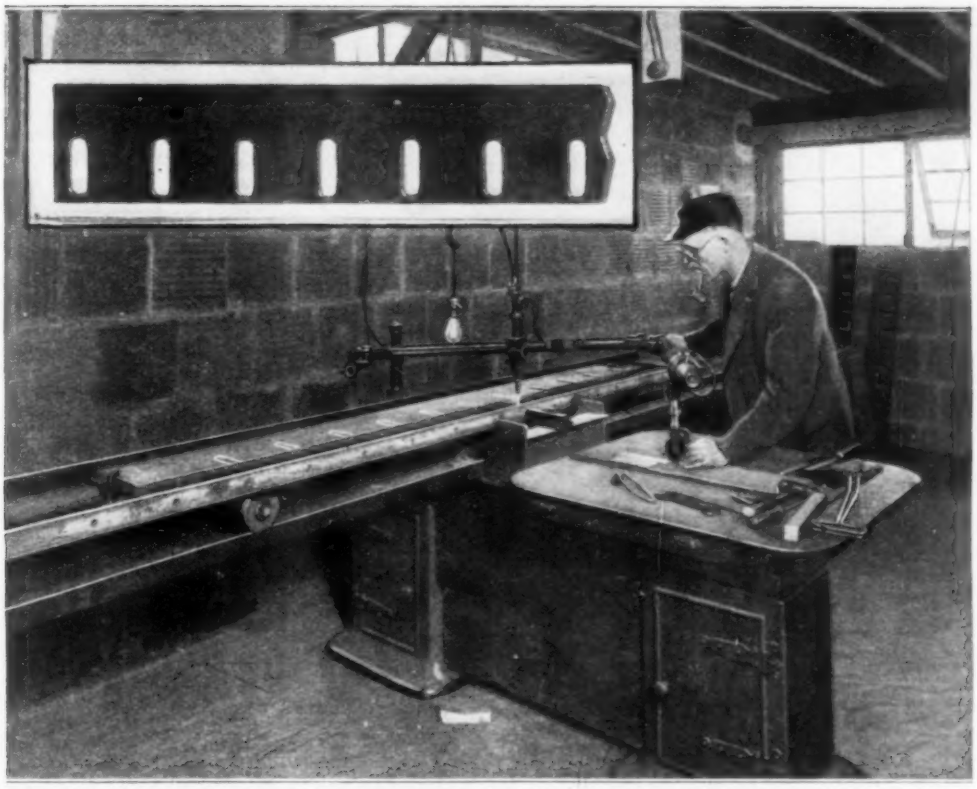
The oscillophore is now so constructed that the capsule is projected on a screen and its movements may be seen simultaneously by a number of observers.

ELECTRICALLY DRIVEN WATCH HAS MOTOR AND BATTERY

An electric motor, reduced to such a minute size that it can be used to operate the works of a watch of normal shape, is the result of a recent French invention. Besides the motor, the watch contains a battery, equally minute, to furnish the necessary current. This is a liquid battery in a water-tight case, with partitions, all of an indestructible material. The motor is only about ⅜ in. in diameter, and is composed of two concentric fields, with an armature mounted between them, all serrated. Its commutator is in the form of a small cavity which retains in it, by capillary attraction, one drop of mercury. What would correspond to the brush of the commutator is a thin metallic pin that moves in and out of this drop of mercury. The hands of the watch are driven by two ratchet wheels, which are impelled, in a ratio of 60 to 1, by two pawls actuated by the motor, the action of these pawls being regulated by a balance wheel very similar to that of an ordinary watch. There is, of course, no daily rewinding, and the only thing that ever requires attention is the battery, which, it is claimed, would have to be renewed only once a year.



Below, at the Right, the Watch is Shown Complete, Including the Battery and Motor, with the Back of the Case Removed. At the Left of This, Only the Motor is Shown in Place with the Armature Not in Position, and above This, These Parts are Greatly Enlarged Showing the Concentric Fields, and the Armature Out of Place above Them. Directly Above Are Two Side Views of the Watch



The Bed Carrying the Veneer-Knife Blank is Stopped at Predetermined Intervals by Index Bars. The Acetylene Torch is Then Guided over Marked Areas, Leaving a Slot. Insert: A Veneer Knife Cut by the Acetylene Torch

ACETYLENE TORCH CUTS HOLES IN VENEER CUTTER BLADES

Steel knives used in the woodworking industry for cutting veneer from tree trunks are generally quite long and thick. They also have a row of bolt slots that are laid out carefully to assure correct attachment of the blade to its support. One eastern machine-tool company has utilized the acetylene torch for cutting out these bolt slots. The device consists of a traveling bed which is stopped at predetermined points by index bars, and on which the knife blank is laid. Overhanging this bed is a movable arm which holds the torch. When in operation, the machine travels to a stopping point, and the workman applies the torch to markings previously made on the blank.

¶An iceberg which has withstood with some loss the heat of the sun for an entire year was observed recently seven miles off the coast of Cape Race. The giant berg was seen at the same place about a year ago, apparently hard aground.

SWAMP GRASS AND SILK IN HAT COMBINATION

Silk and swamp grass are two materials which one would suppose to be far removed from each other when finally converted to a state of usefulness, but such is not the case when the hat of an American musical-comedy star is considered. Here the two widely divergent commodities are beautifully combined in what its creators have termed "marabout silk." Two gorgeous white pompons of the odd combination drape over the ears and cheeks of the wearer, while the brim and crown are made in turban style.

MOVING EIGHT-STORY BUILDING WITH TENANTS AT WORK

Transportation of a brick or frame building intact from one point to another is an old story in this country, but not the transportation of an eight-story steel building, weighing 4,000 tons. That is another story and an entirely new one. The scene of the occurrence was the downtown section of Pittsburgh, and the cause was the widening of the street upon which it fronted. The new building line was 40 ft. back from the old one, and the structure had to be moved that distance. The building was separated from the next one, with part of the sidewalk remaining attached to it. Nothing else in the building was disturbed, and during the whole process of moving, the old war slogan, "business as usual," was observed, even to the extent of continuing to trade in the store on the ground floor. The track over which the structure was moved was formed of heavy steel rails on a foundation of about 100,000 ft. of 12 by 12-in. timbers. Half-inch steel plates were laid between the base of the building and the rollers. The motive power was twelve 10-in. jackscrews, held horizontally and blocked forward as the building moved. The rhythmic operation of these jacks, which was very essential, was regulated by signals by a whistle in the hands of the man in charge.

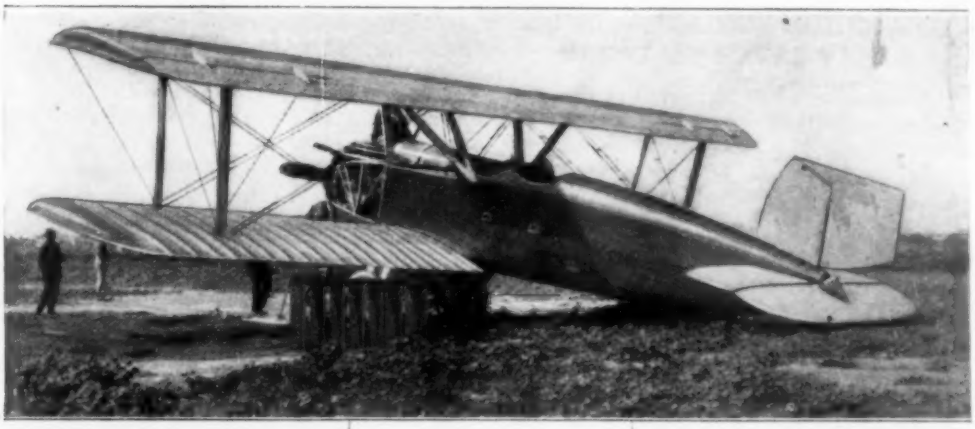
The Jackscrews by Means of Which the Building was Moved were Operated below the Street Level. The Building is Shown Moved About Halfway

LINOTYPE MACHINE IS MASTER OF CHINESE LANGUAGE

The simplification of the Chinese language and alphabet has been carried so far by a manufacturer of typesetting machines that the alphabet has been reduced from the overwhelming number of over 6,000 distinct signs and characters to only 35. Types of these are now supplied, and it is no more difficult to compose printed articles in Chinese than in any other of 42 languages for which this same concern has evolved type and machines. By adopting this typesetter, the publishing business of China would be greatly simplified.

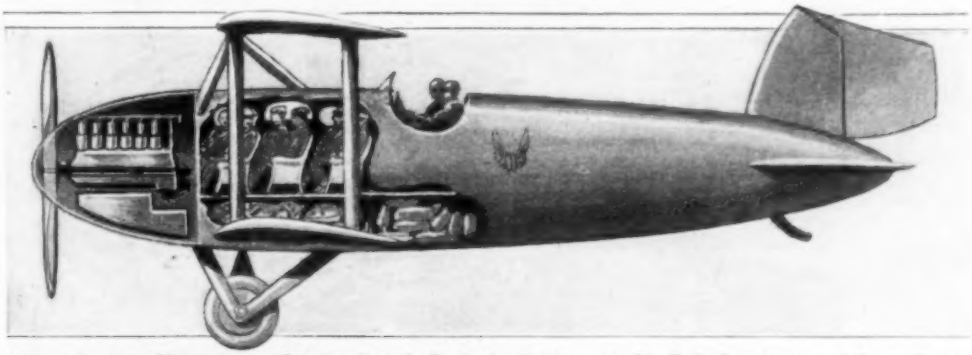
NEW TYPE AIRPLANE WILL TRY FOR COAST-TO-COAST RECORD

The "Cloudster," a product of California aerial-engineering skill, and the latest entrant in the 3,000-mile transcontinental nonstop race against time, may be expected to make its "hop-off" most any day within the very near future, as its builders have about concluded a series of successful demonstrations for army, navy, and post-office officials. With a wing spread of 52 ft. and an over-all height of 13 ft., the machine is said to be the largest single-engined plane ever built. Designed with the coast-to-coast nonstop



The "Cloudster," Viewed from the Rear: This, Said to Be the Largest Single-Engined Airplane in the World, is being Groomed for the Transcontinental Nonstop Flight

An Idea of the Size of the "Cloudster" is Conveyed by Its Height, as Shown by the View at the Left. Right: So Powerful Is the Drag of the 480-Horsepower Special Liberty Engine That Blocking of the Landing-Gear Wheels is Resorted to When the Machine is Tuned Up



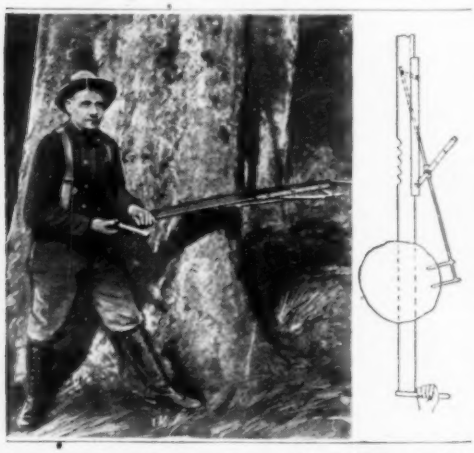
A Part Sectional View of the "Cloudster" as It Looks in Flight, with Its Full Complement of Seven Passengers, the Pilot, 1,500 Pounds of Mail, and 700 Gallons of Gasoline in the Special Tanks Directly beneath the Engine: The Passengers Occupy Wicker Chairs in the Completely Inclosed Cabin

dash in view, the flier is powered by a special 480-hp. Liberty engine, and has a fuel capacity of 700 gal., enough, it is thought, to make the continuous flight possible. Loaded with a weight equivalent to seven passengers, 1,500 lb. of mail, and its full fuel load, the powerful craft has attained a speed of 105 miles an hour, maximum, and slowed down to a landing speed of only 50 miles an hour. On a recent altitude test flight, flown by Pilot Eric Springer, the machine broke all Pacific-coast records, climbing 19,160 ft. in less than 1½ hours.

This record has received the official recognition of the Aero Club of southern California, and will doubtless stand for some time to come.

SAW GUIDE FOR LUMBERMEN GREAT SAVER OF LABOR

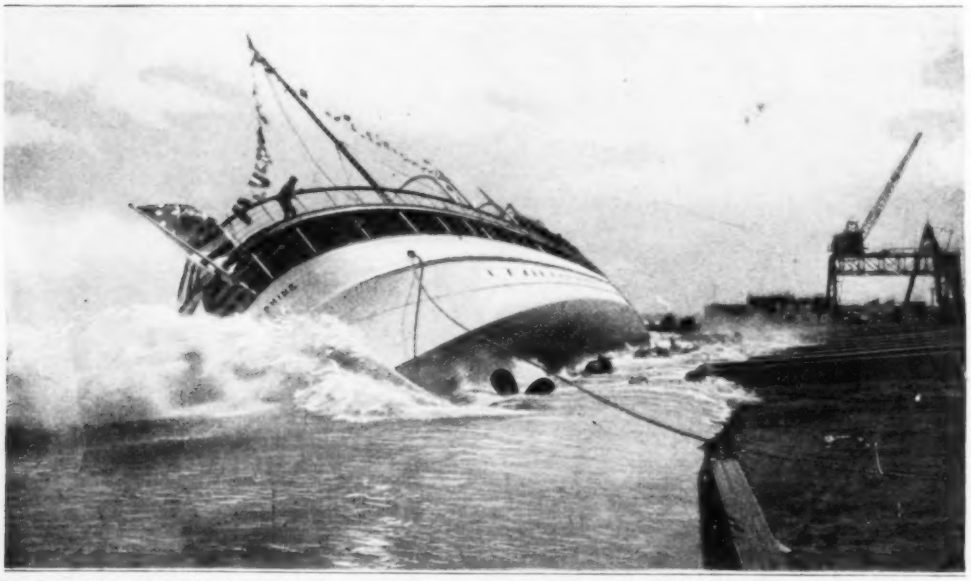
One man will be eliminated in the tree-cutting operation by the adoption of a new saw guide for lumbermen. By its use it will no longer be necessary to have a man at the other end to steady and keep the saw from buckling. Not only will the guide force a straight cut, but it will hold the saw very rigidly by means of a clamp on the blunt edge. The guide is kept in position on the saw by two reach-rod links, pivoted to the guide and to a supporting arm, held fast by driving two spurs at its end into the tree. One of the links is perforated with holes for adjustment as the saw works deeper into the tree. Trees standing, lying down, or suspended from each end, can be sawed by one man.



One Man Saws the Tree Down with This Saw Guide. Prongs Driven into the Tree Hold It in Place. Right: Diagrammatic View

THE 1,700-TON YACHT "DELPHINE" LAUNCHED SIDEWAYS

There was launched, on April 2, in a Detroit shipyard, the yacht "Delphine," which is exceptionally large for a privately owned vessel. It was launched sideways, which is a novel method on the Great Lakes, although in some of the yards that were organized elsewhere during the war this was universal. The "Delphine" is a steel ship, 258 ft. long, with a beam of 35 ft. 6 in., and a draft of 15 ft. 3 in., fully loaded, giving a displacement of 1,700 tons. When not quite fully loaded it can pass through the Welland Canal to the ocean. The vessel has two propellers, driven by two four-cylinder quadruple-expansion engines, and three water-tube boilers. Its speed is 16 miles an hour, and the oil-fuel capacity is sufficient for a cruising range of 7,000 nautical miles. The design is somewhat unusual in yachts, the profile giving it very much the appearance of a naval ship, on account of its heavy bilges.

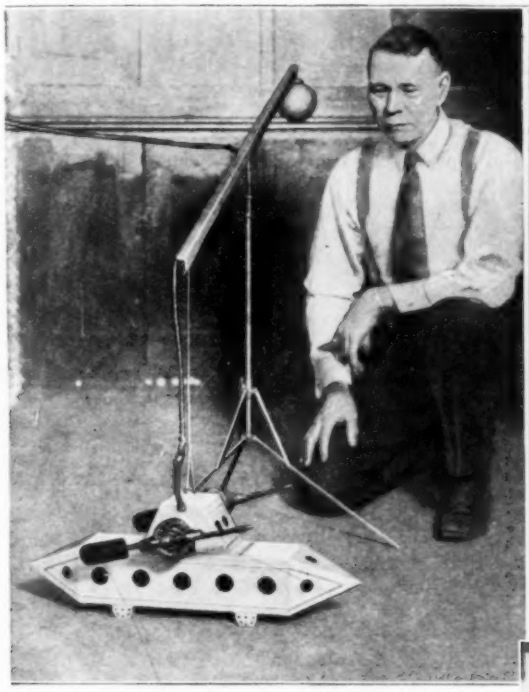


The Launching of the "Delphine" Sideways: When the Yacht Struck the Water It Careened Over to an Angle of 45 Degrees, and Then Rocked Backward and Forward for Several Minutes, Rolling Huge Waves over the Docks, and Sending the Spectators Scurrying to Higher and Drier Ground

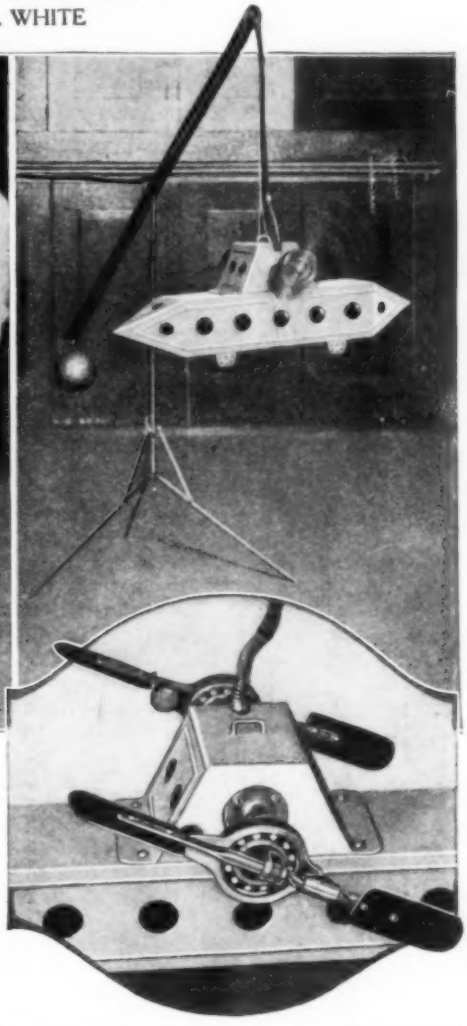
ROTARY WINGS THAT FLY WITHOUT FLAPPING

Model Flying Machine Rises Vertically and Moves Forward or Backward at Operator's Will—"Verticavion" Has Few Parts and No Planes

By HENRY S. WHITE



The Model "Verticavion" Is on the Ground Ready for a Demonstration. It is Hung from One End of a Pivoted Beam, at the Other End of Which Is a Weight, Leaving Exactly Half a Pound Unbalanced



Above: The Propellers are Running, and the Model has been Lifted from the Floor, and is Kept Suspended in the Air. Below: A Close-Up of the Model Showing the Propellers and the Housing for the Motor That Drives Them

ANY propelling device for a flying machine that could exert action upon the air corresponding to the downstroke of a bird's wing continuously, without any loss corresponding to the counteracting upstroke, would furnish a flying capability surpassing even that of the flitting albatross or the soaring eagle. A new flying propeller has been devised that corresponds to a wing action that is all downstroke without any upstroke, or in other words, all power with approximately no loss. It is appropriately compared to a wing, because it has already been applied to the work of lifting and supporting as well as propelling a heavier-than-air machine, completely devoid of planes. It has done this successfully on a model that weighs 8½ lb., and from the following particulars of the device, it will be evident that there are good prospects for a very interesting development in this new method of lifting and propelling conveyances that could be used for transportation over land or water; also for doing more effectively the work of observation balloons, and for many other purposes both military and civil. The applications are as yet confined to speculation, but the propelling device itself has reached the stage of actual demonstration.

This new propeller rotates, and it is two-bladed, but it is more nearly related to a paddle wheel than to a screw propeller. In effect it is a feathering paddle wheel, which, of course, in itself is not a new idea, the novelty lying altogether in

the manner in which the paddle feathers, and the means employed to operate it.

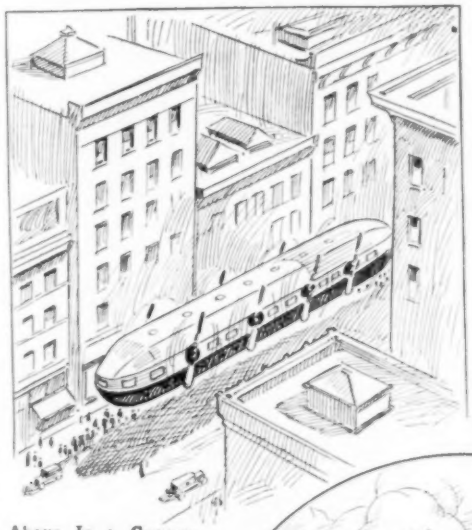
The paddle has two blades, one at each end of a shaft to which they are rigidly connected. This shaft passes at right angles through the forked end of the main driving shaft, having a turning fit in the jaws of the fork. Pinned to the paddle shaft at its center is a collar that fits slidably between the inside faces of these jaws, so that the paddle shaft, while it can rotate in the fork, cannot move longitudinally with relation to it. Near its forked end the main driving shaft passes through a sleeve which is mounted adjustably in a fixed bearing that forms its support. On the end of this sleeve, adjacent to the paddle shaft, is a circular flange with its center eccentric to the common center of the sleeve and the driving shaft. On this flange is fastened rigidly a hub, which forms in effect the inner stationary race of an ordinary ball bearing, the outer revolving race of which fits tightly into a ring, or circular housing, which has a small luglike extension at a point where the paddle shaft crosses it. Into this extension is pivotally mounted a short sleeve that slidably fits the paddle shaft. At this part of the paddle shaft there is cut a spiral thread, into which fits a stud that is part of the sleeve, so that when the sleeve is moved along the shaft the stud follows the thread on the shaft, and rotates it.

It is obvious that when the driving shaft rotates the paddle shaft, the sleeve on the latter will carry around with it the ring to which it is pivotally connected, and which is mounted on the outer revolving race of the ball bearing. As this ring is eccentric with relation to the driving shaft, the sleeve which it carries will change its position radially as regards the center of the driving shaft. Thus, in half a revolution the sleeve is moved, with relation to the center of the driving shaft, the distance between this center and the center of the ball bearing on which is mounted the ring to which the sleeve is connected, and consequently the sleeve slides that distance along the threaded part of the paddle shaft, which is rotated, more or less, as determined by the pitch of the thread. In the second half revolution this movement will, of course, be reversed, and in each revolution there is an oscillation of the paddle blade. By this means the feathering action is accomplished, for the thread on the shaft is so designed that the stroke of the sleeve, at each half revolution, gives the blade a quarter turn. The blades at each end of the paddle shaft are fixed at right angles to each other, and as the paddle shaft revolves, each blade has its face turned in the direction for striking the air through the same half of the revolution, and has it turned for cutting the air also in the other and opposite half of the revolution. Thus there is perfect feathering action. The part of the revolution in which these blades are to strike the air can be changed so as to exert this force in any direction, upward, or downward, or horizontally forward or backward, by a device adjustable by hand by which the line through the eccentric centers of the two elements of the device may be moved one way or the other and then set, thus changing the point at which the oscillations of the blades begin and end.

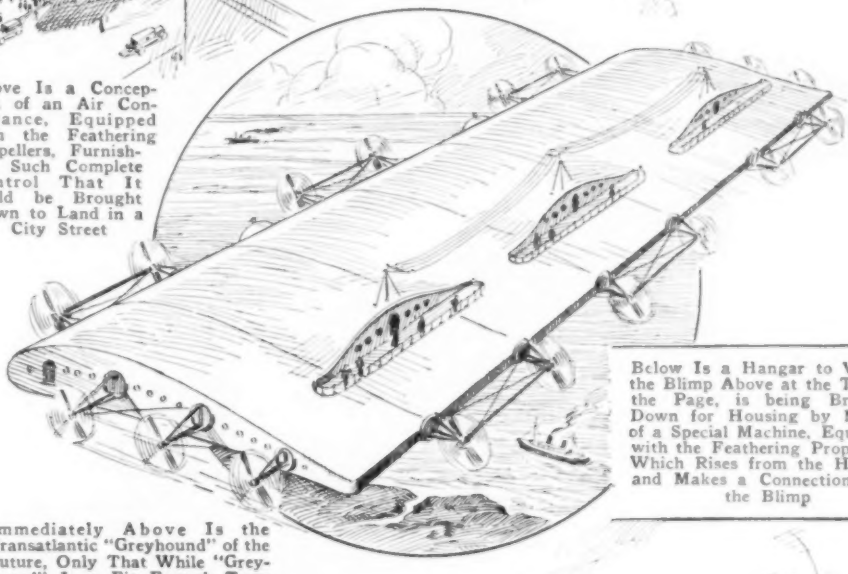
The enterprise has as yet reached only the model stage. A box-shaped model has been built in which two paddle shafts, one on either side, are rotated by a common power shaft driven by a ½-hp. electric motor at 2,000 r.p.m. The whole device weighs 8½ lb., and it is demonstrated by hanging it from a horizontal bar supported at its center like the beam of a pair of scales. One side of the beam carries a weight of 8 lb., leaving ½ lb. unbalanced for the machine to lift. When the paddles are set so as to strike the air only in a downward direction, the model lifts itself vertically from the ground. When set so that the paddles strike the air partly downward and partly horizontally, the model is swung around the central support in the manner of a merry-go-round. The setting can be changed to reverse the direction of travel, or to pull the machine down instead of lifting it upward.

Calculating on the basis of this performance at 2,000 r.p.m., the paddles lift, or propel, 10 lb. per horsepower, but it is reasonable to anticipate better results in a machine on a larger scale, where the parts can be better proportioned to the amount of work done. Moreover, it is fair to assume possible higher speeds than 2,000 r.p.m. and also more efficiently shaped paddle blades.

In all aerial applications of this feathering paddle wheel, the adjustability of the point of feathering will furnish means for controlling the stability of the conveyance as well as its direction. It requires no great flight of the imagination to think of it describing vertical rings in the air, and thus looping the loop without turning upside down. On account of its indirect resemblance to a bird flying upward, it has been proposed to call it a "verticavion."

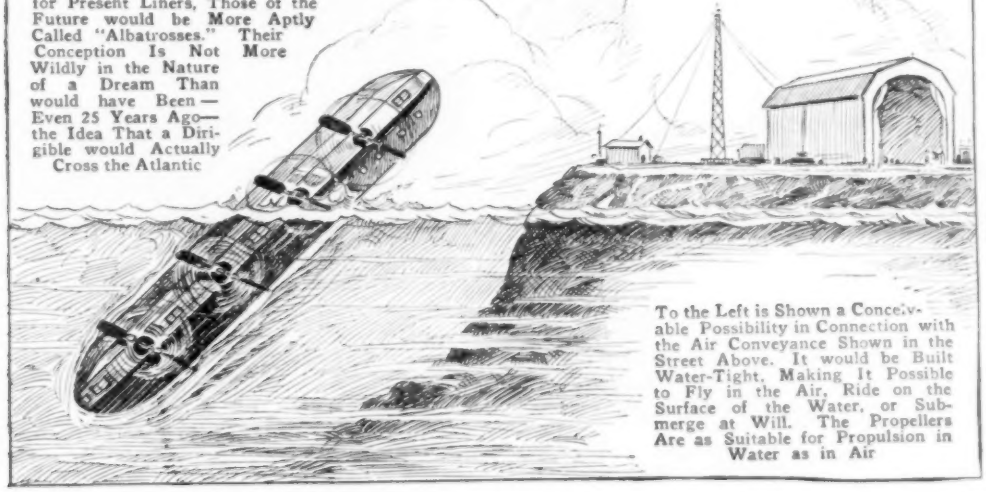


Above Is a Conception of an Air Conveyance, Equipped with the Feathering Propellers, Furnishing Such Complete Control That It could be Brought Down to Land in a City Street



Below Is a Hangar to Which the Blimp Above at the Top of the Page, is being Brought Down for Housing by Means of a Special Machine, Equipped with the Feathering Propellers, Which Rises from the Hangar and Makes a Connection with the Blimp

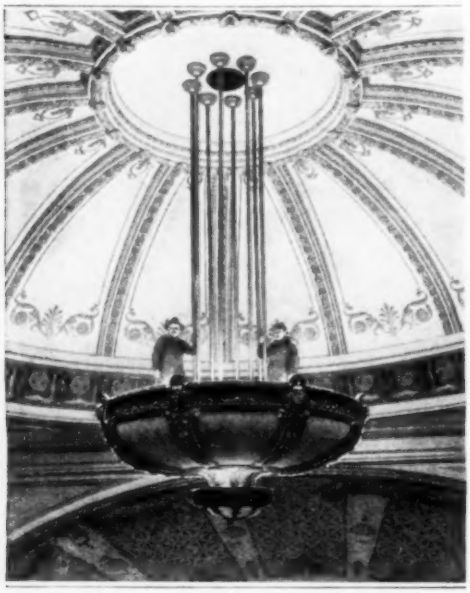
Immediately Above Is the Transatlantic "Greyhound" of the Future, Only That While "Greyhound" Is a Fit Enough Term for Present Liners, Those of the Future would be More Aptly Called "Albatrosses." Their Conception Is Not More Wildly in the Nature of a Dream Than would have Been — Even 25 Years Ago — the Idea That a Dirigible would Actually Cross the Atlantic



To the Left is Shown a Conceivable Possibility in Connection with the Air Conveyance Shown in the Street Above. It would be Built Water-Tight, Making It Possible to Fly in the Air, Ride on the Surface of the Water, or Submerge at Will. The Propellers Are as Suitable for Propulsion in Water as in Air

LARGEST LIGHTING FIXTURE OF THE INDIRECT TYPE

The largest indirect-lighting fixture in the world illuminates the auditorium of a large theater in Milwaukee, Wis. Built in



The World's Largest Indirect-Lighting Fixture: It Is 15 Feet in Diameter, Weighs Over 2½ Tons, and Blazes with 118 Tungsten-Filament Lamps

the form of two inverted bowls, the larger, 15 ft. in diameter, at the top, the big fixture is fitted with 118 tungsten-filament lamps. Of this number the main reflector contains 100 of a 200-watt rating, and the smaller bowl 18 of the 60-watt size. Dividing the large bowl into quarters are glass screens colored red, blue, amber, and white. With a skillful operator manipulating the switches and dimming apparatus, thousands of shade combinations and tones can be produced. For cleaning the 5,500-lb. fixture, access is had through a trapdoor in the center of the ceiling reflector.

ALBERTA HUNTS DISCLOSE NEW ANIMAL SPEEDS

Interest in the speeds of animals in flight is constantly being stimulated by the publication of new and interesting facts concerning the subject, which are brought in by huntsmen of the western hemisphere. The latest tests have been made by hunters in southern Alberta, Can., on a stretch of land that is gently rolling and treeless. The hunters rode in a light motor car and turned their particular attention to the coyote and antelope, which are commonly conceded to be very fleet animals. The motor car generally outran the former animal within three or four miles, and at no time during the chase was its speed above 25 miles an hour. Occasionally one of the animals would attain a speed of 35 miles per hour for the first mile, but the succeeding miles registered a marked drop. Alberta antelopes have been overtaken by motor cars on the prairie without difficulty. Inasmuch as high speed from the cars while traveling over the rugged prairies cannot easily be obtained, it is concluded by the hunters that the antelope in the neighborhood of Alberta do not run at extraordinary speeds.

ARMLESS AUTOIST DRIVES CAR WITH SURENESS OF EXPERT

Blessed with the "will to conquer," Fred Ericson, a billposter of Kansas City, Mo., though armless, having had these members severed just below the shoulder 10 years ago, has so remodeled his automobile that he is able to drive it through the crowded city streets with the precision of an expert. Five metal and leather cups, placed on the steering-wheel rim, form receptacles for the arm stumps, affording a sure grip. A special throttle lever is manipulated by the right knee, an extension horn button by the left, and changes of speed and braking are accomplished by

Lack of Arms does Not Prevent This Inventive Genius from Enjoying the Pleasure of Motoring. The Five Cups on the Steering Wheel Enable Him to Drive His Car with Expert Precision

means of pedals. The car is equipped with an electric starter, which is also controlled by the feet.

FERRYBOAT SWIMMING POOL IS NOVEL PLAYGROUND

The Ferryboat Pavilion Shown Above has been Added to the Swimming Pool on a Connecticut Estate. It is Fitted with the Usual Complement of Lifeboats and Preservers. Below: A View of the Spacious Dance Hall within the Pavilion

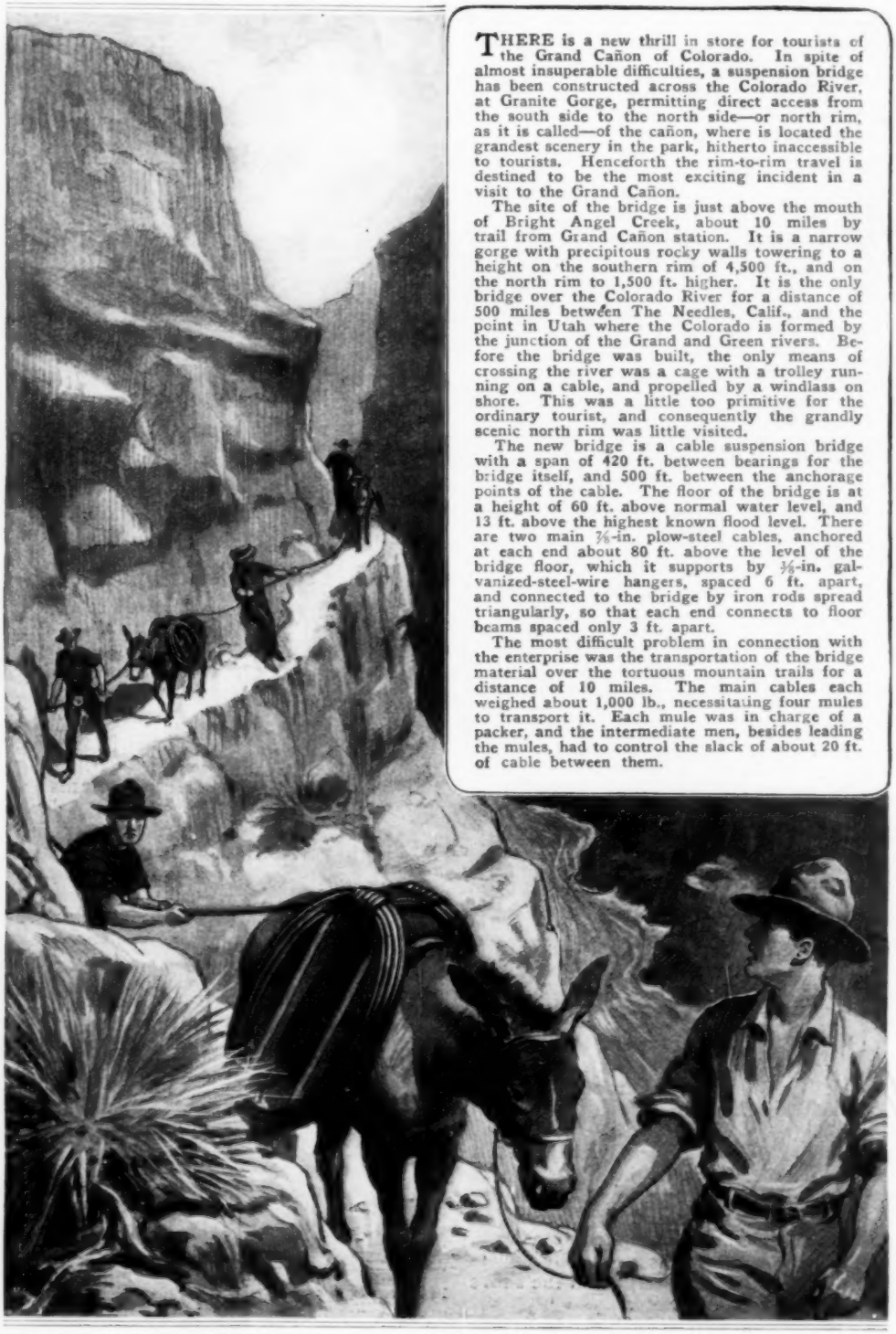
As a fitting complement to a swimming pool built on a Connecticut estate recently, a ferryboat pavilion has been erected. This boat has all the fittings of a regular craft of its type, being equipped above with a lifeboat, life preservers, funnel, and pilot house. The cabin is a spacious dance floor where diversion from the swimming sport may be indulged in. The swimming pool forms a forward deck for the ferry, and is surrounded by a sidewalk set with benches and chairs.

CONCRETE SHORE LINE HOLDS BACK SEA TIDE

After repeated loads of loose filled-in rock had failed to check the destructive effect of the tides on his dance-pavilion foundations, one California resort owner was obliged to devise a new breakwater. An important feature to be conserved at any cost, was the natural lines and beauty of the rugged shore, and this precluded the construction of a regular sea wall. Finally the problem was solved by covering the rocks already dumped on the shore with a binder of concrete.

In Preserving the Shore Line Here, the Usual Rocks and Bowlders were Bound with Cement

SUSPENSION BRIDGE ACROSS GRAND CAÑON MAKES ALL PARTS OF PARK ACCESSIBLE

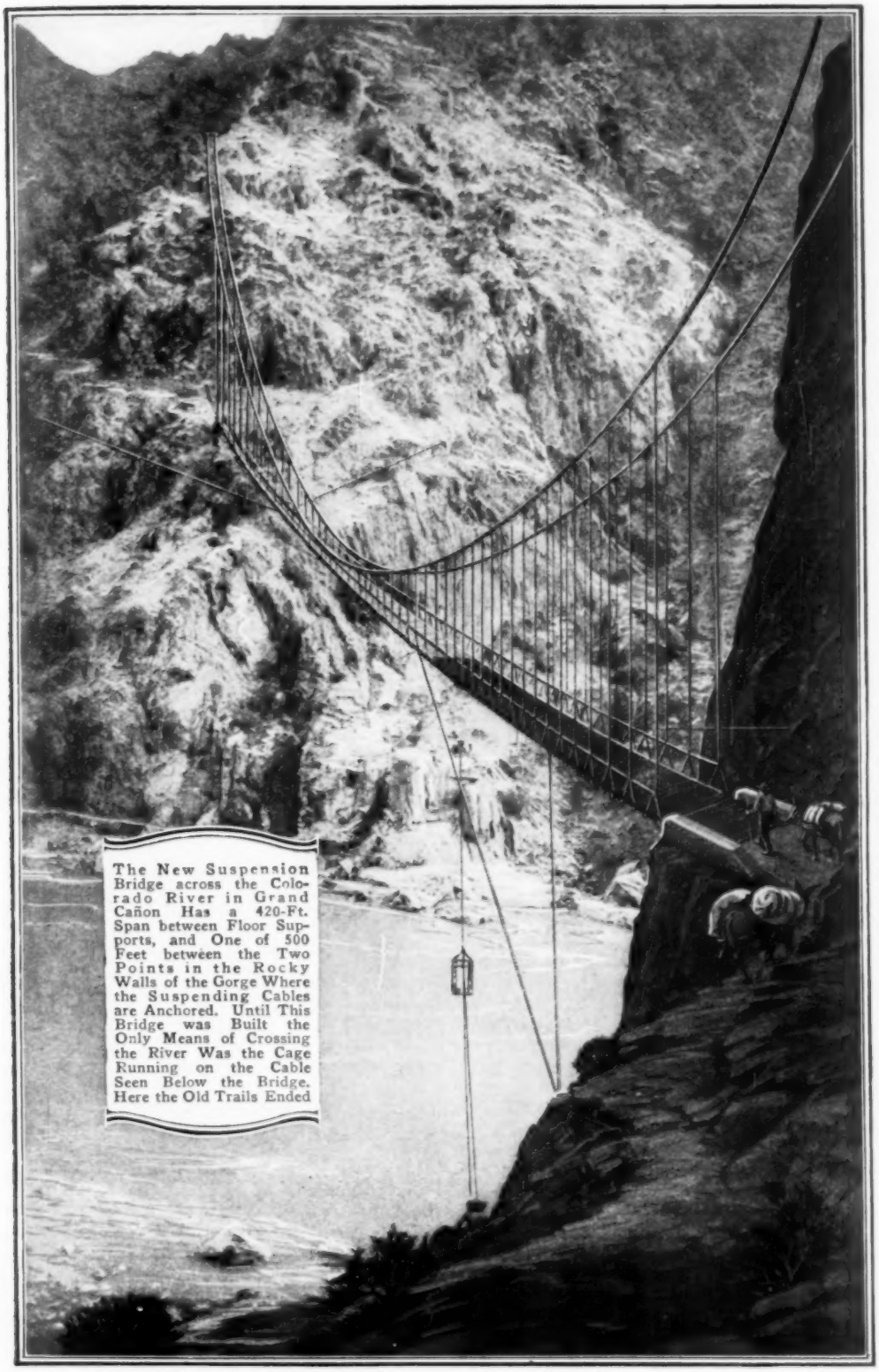


THERE is a new thrill in store for tourists of the Grand Cañon of Colorado. In spite of almost insuperable difficulties, a suspension bridge has been constructed across the Colorado River, at Granite Gorge, permitting direct access from the south side to the north side—or north rim, as it is called—of the cañon, where is located the grandest scenery in the park, hitherto inaccessible to tourists. Henceforth the rim-to-rim travel is destined to be the most exciting incident in a visit to the Grand Cañon.

The site of the bridge is just above the mouth of Bright Angel Creek, about 10 miles by trail from Grand Cañon station. It is a narrow gorge with precipitous rocky walls towering to a height on the southern rim of 4,500 ft., and on the north rim to 1,500 ft. higher. It is the only bridge over the Colorado River for a distance of 500 miles between The Needles, Calif., and the point in Utah where the Colorado is formed by the junction of the Grand and Green rivers. Before the bridge was built, the only means of crossing the river was a cage with a trolley running on a cable, and propelled by a windlass on shore. This was a little too primitive for the ordinary tourist, and consequently the grandly scenic north rim was little visited.

The new bridge is a cable suspension bridge with a span of 420 ft. between bearings for the bridge itself, and 500 ft. between the anchorage points of the cable. The floor of the bridge is at a height of 60 ft. above normal water level, and 13 ft. above the highest known flood level. There are two main ⅞-in. plow-steel cables, anchored at each end about 80 ft. above the level of the bridge floor, which it supports by ⅓-in. galvanized-steel-wire hangers, spaced 6 ft. apart, and connected to the bridge by iron rods spread triangularly, so that each end connects to floor beams spaced only 3 ft. apart.

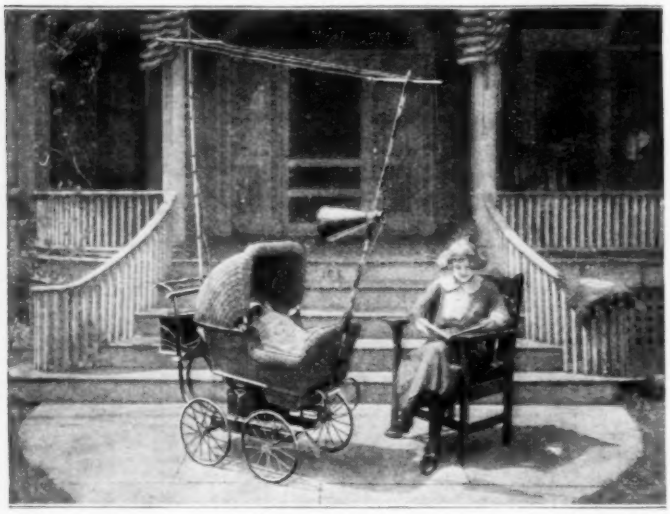
The most difficult problem in connection with the enterprise was the transportation of the bridge material over the tortuous mountain trails for a distance of 10 miles. The main cables each weighed about 1,000 lb., necessitating four mules to transport it. Each mule was in charge of a packer, and the intermediate men, besides leading the mules, had to control the slack of about 20 ft. of cable between them.



The New Suspension Bridge across the Colorado River in Grand Cañon Has a 420-Ft. Span between Floor Supports, and One of 500 Feet between the Two Points in the Rocky Walls of the Gorge Where the Suspending Cables are Anchored. Until This Bridge was Built the Only Means of Crossing the River Was the Cage Running on the Cable Seen Below the Bridge. Here the Old Trails Ended

WIRELESS BABY CARRIAGE SINGS BABY TO SLEEP

The latest development in wireless is a megaphone attachment for the baby carriage designed to amuse the baby. In a recent test, music was sent from a central station and transmitted through the megaphone connected to the receiving wires, though the carriage was more than a mile away. A solution is seen for the tired mother who is faced with the problem of entertaining her offspring while occupied with other duties.



A Combination Baby Carriage and Wireless Talking Machine Designed to Furnish Entertainment for the Infant: Music is Sent from a Central Station through the Megaphone Attachment

NEW MOISTENER IS HANDY AND DOES NOT CORRODE

Displacing former methods of moistening stamps, labels, gummed stickers, etc., preparatory to their attachment to bottles, cases, boxes, and the like, is a very practical moistening device. The moistener consists of a removable woolen applicator which is rubbed across the glued surface, imparting a thin film of water. This applicator obtains its water supply from a bulblike metal reservoir which is held in the hand of the user. Water flows from the reservoir through small holes in an internal compartment which holds the applicator.

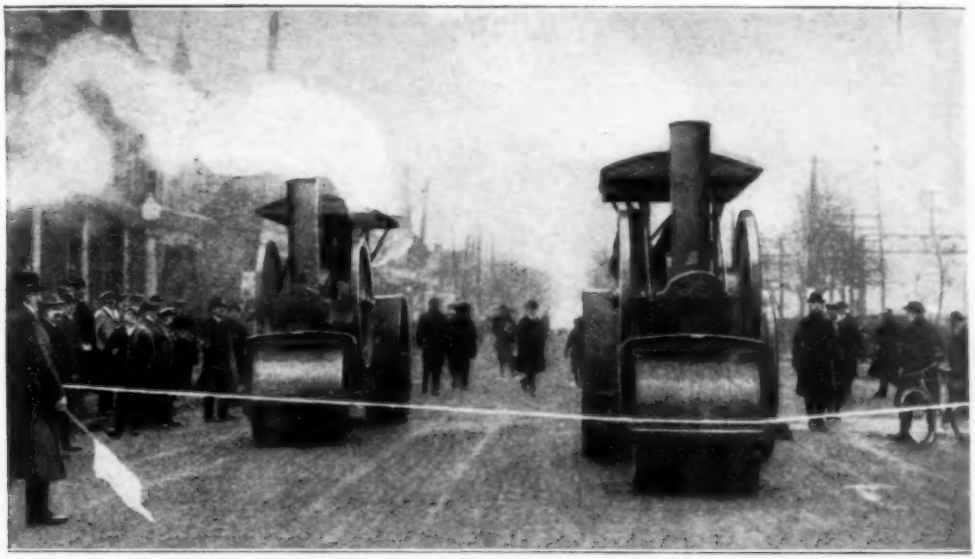
FALLING COIN DISABLES MAN FOR TWO WEEKS

That the momentum attained by a falling 50-cent piece is sufficient seriously to injure a person who happens to be in the path of its descent was indicated not long ago when a Los Angeles postal employe was struck by such a missile. He was in the act of removing the accumulation of mail from a large letter box on the first floor of a tall office building. While he was reaching into the box to lift out a handful of mail, a bunch of letters began falling down through the chute which led from the top floor. Being held in an edgewise position by the narrowness of the chute they attained a terrific speed by the time they reached the box. One of these letters happened to contain a 50-cent piece and it struck the postman squarely on the back of the hand. The blow was almost as sharp and violent as if it had been delivered by a flying fragment of shrapnel, and the coin striking the flesh edgewise cut deep, exposing the bone. Some of the ligaments on the back of the hand were so bruised that the fingers were stiffened temporarily. So deep was the gash that the postman will always carry a scar of the cut received in this unusual manner. Because of his injuries he was laid off for two weeks.

The postman stated that all employes engaged in emptying mail boxes fed by chutes have to be exceedingly careful in taking letters out lest the sharp edge of a descending envelope strike the back of their hand. Letters without coins in them requiring six or eight cents postage are sufficiently heavy to deliver a very painful blow.

STEAM AND GAS-ENGINE ROAD ROLLERS STAGE NOVEL RACE

An interesting feature of the program of the good-roads show, held in Chicago recently, was an "athletic meet" participated in by eight 10-ton steam and gasoline-engined road rollers. Honors went to the gasoline-powered monsters in every event. In the speed contest around a



A Close Finish between Two Steam Rollers Racing to Qualify for a Final Match between Gas and Steam Rollers: The Race Was a Road-Show Feature

three-block triangular course, the winning gasoline roller "breezed" home in the phenomenal time of 3 minutes 55 seconds. Some trouble was experienced with the chains used in the tug of war, the originally provided ¾-in. size proving incapable of withstanding the enormous strain and snapping like pieces of twine. Much heavier ones being substituted, the gasoline rollers proved their superiority over their steam-engined rivals by pulling them backward across the well-sanded arena.

"SIMPLICITY TAX PENNY" PLEADS ADOPTION OF SALES TAX

Traveling salesmen are being furnished with a coin, called the "simplicity tax penny," which they are expected to distribute in as large numbers as possible. Its purpose is to incite the recipient to write to his congressman, and advocate the one-per-cent simplicity sales tax. The coin was designed by an eminent sculptor for the National Council of Traveling Salesmen's Association.

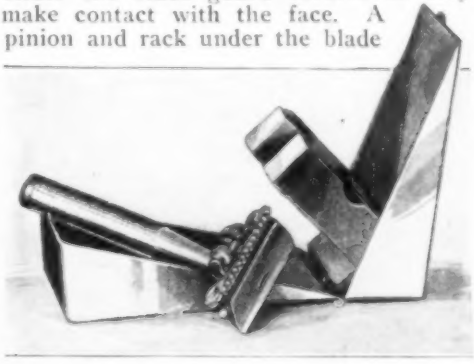
1%
SALES TAX PENNY
1%
SIMPLICITY TAX PENNY
WRITE YOUR CONGRESSMAN AND RECOMMEND THE 1% SIMPLICITY TAX
NATIONAL COUNCIL OF TRAVELING SALESMEN'S ASSOCIATIONS OF AMERICA

BY COURTESY OF THE KEYSTONE

The Obverse and Reverse Faces of the Coin That is being Widely Distributed by Traveling Salesmen in Order to Promote the Sales Tax

RAZOR BLADE GETS PROPER SLIDE IN NEW HOLDER

A safety shaving unit in which the blade moves slightly from side to side as it is pulled across the face, is the latest home tonsorial implement. Two small rollers under the blade guard revolve as they make contact with the face. A pinion and rack under the blade



The Little Rollers under the Razor-Blade Guard Rub against the Face Simultaneously with the Blade, Causing the Latter to Move from Side to Side

are in turn operated by the rollers. The pinion has a small pin on its top side which moves from side to side in a slot in the blade, imparting a motion similar to the slide a barber gives the ordinary razor.

NOVEL DEVICE USES SUN RAYS AS A COOKING-HEAT MEDIUM

Long years ago, a gentleman in India cooked a meal for some of his friends by reflecting the rays of the sun from a mirror onto his cooking utensil. This was of course out of the question on rainy days and during the night. Now comes a mechanical harness for the heat of the sun's rays wherein it is preserved for night and cloudy-day use. At the Smithsonian Solar Observing Station on Mt. Wilson in California is such a device. A large 7 by 10-ft. mirror, built semicylindrical in shape and made of aluminum-covered steel plates, focuses the rays of the sun on a 1½-in. pipe placed centrally in its frame. This pipe carries an oil of high boiling point, which after heating from the reflected rays, rises to a reservoir that is insulated to retain the heat for a long time. Oven compartments are embodied in this reservoir in which the foods may be placed for cooking. After cooling, the oil gravitates to the bottom of the reservoir to an outlet, which returns it again to the pipe in the mirror frame for reheating. In order to retain all the heat possible, the pipe, when exposed in the mirror for heating, is shielded from the wind by plate glass.

Oil of High Boiling Point Running through the Pipe in the Center of the Semicylindrical Mirror, is Heated by Reflected Sun Rays and Raised to the Insulated Reservoir Above

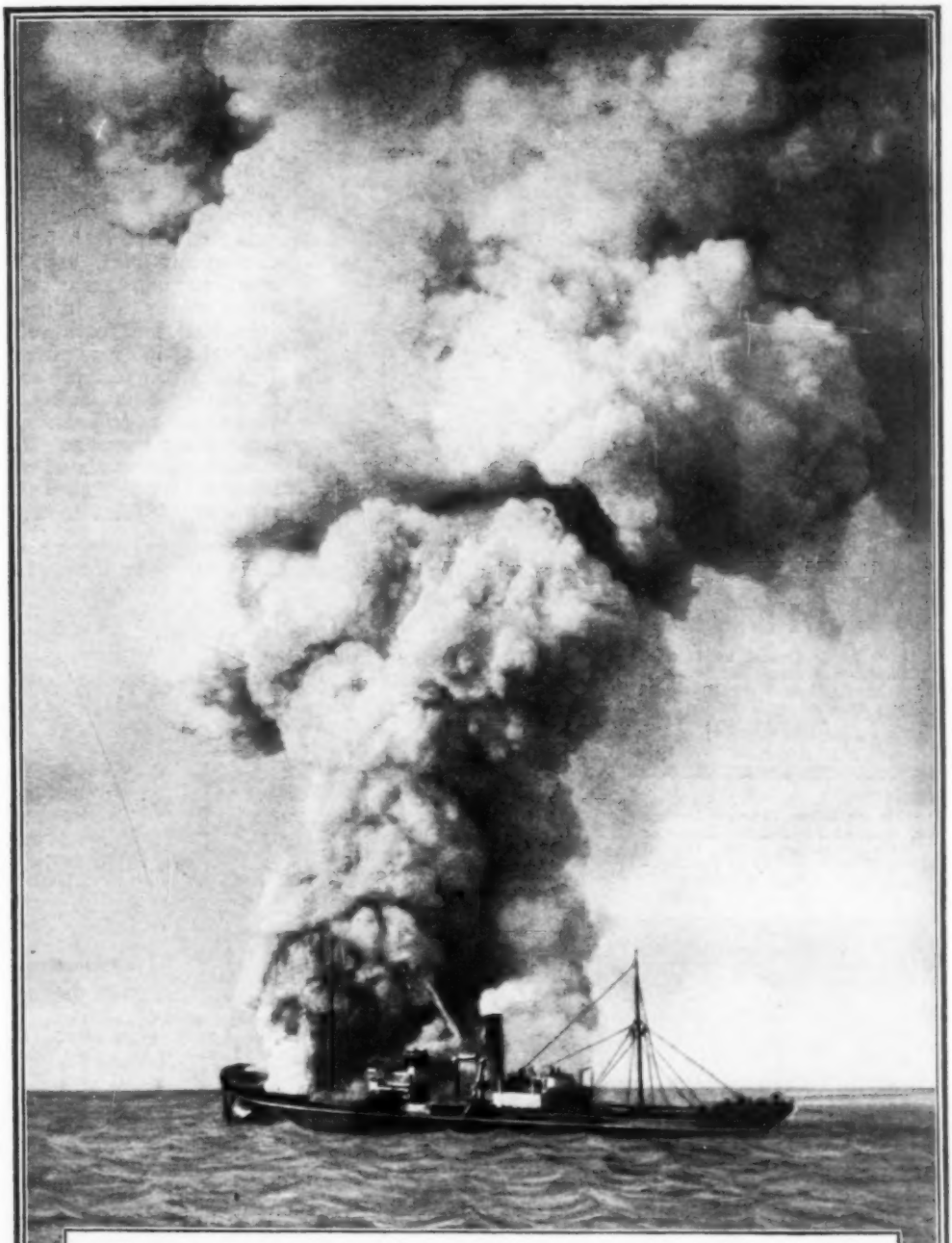
The Reservoir into Which the Cooking Compartments are Built: After Giving Up Its Heat, the Oil Returns by the Pipe on the Right to the Mirror for Reheating

VOLCANIC POWER TO BE USED IN HAWAIIAN ISLANDS

Three expeditions have been sent from this country to Kilauea, the flaming fire-pit of the island of Hawaii, to investigate the practicability of tapping the earth's interior for heat to furnish power to all the Hawaiian Islands. It is proposed to bore at the volcano on "safe ground" some distance away, transforming subterranean heat into electrical energy.

This recalls similar work in Italy where power, light, and heat have been furnished to several Italian cities, including Florence, for a number of years. The method in Italy is to utilize the steam found in subterranean strata for the boilers, eliminating ordinary fuel. The main difficulty that had to be overcome was the corrosive action of the natural steam on iron and steel parts. In the Volterra region a hard stratum of rock was bored through at a depth of 300 to 500 ft., and steam at 356° F. was piped to the boilers.

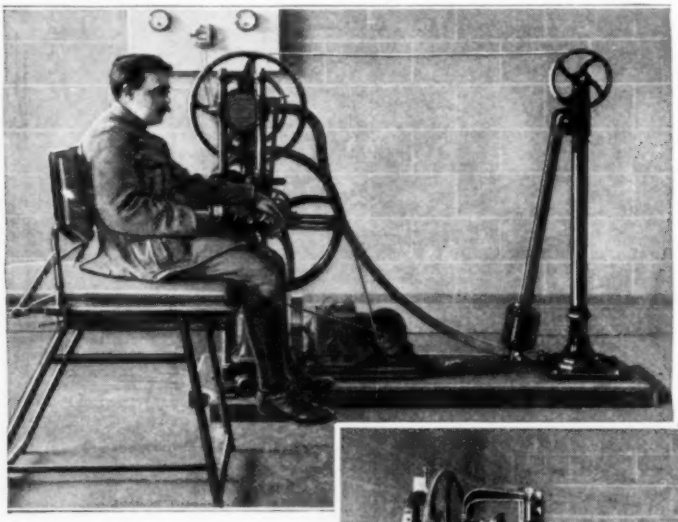
NITRATES AND COAL MAKE SEA FIRE AN INFERNO



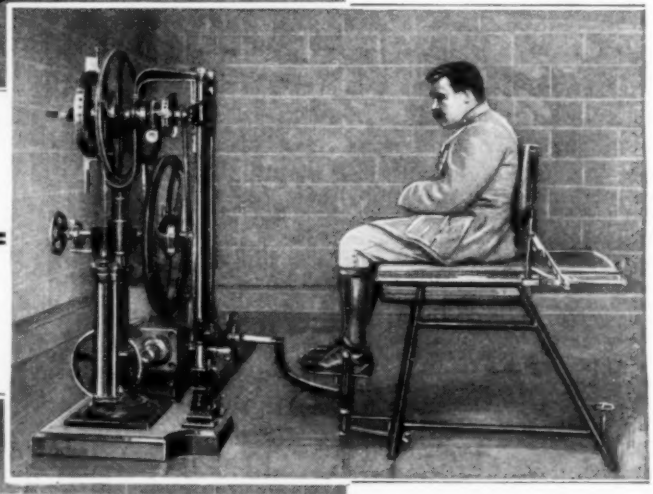
THE terrible consequences of a nitrate and coal fire at sea are indicated by this picture. The steamer, the "Tokyo Maru," had on board nitrates from Chile, and lumber from Portland, Ore., when the fire started May 2 while off the Oregon coast. Within a few hours after the fire broke out, the steamer was a flaming mass, and the passengers and crew were forced to jump into the ocean and take to the boats. Seven passengers are known to have died. The smoke is arising from exploding nitrates and bunker coal. Dry fir lumber is creating a roaring blaze under the smoke. The column of smoke rose to a great height and was seen by the army transport "Buford" over the horizon. The army transport rescued the passengers and crew and took them to Seattle. The "Buford," it will be remembered, gained fame as the "Soviet Ark" which carried Emma Goldman and others back to Russia, the land they lauded.

GYMNASTIC APPARATUS BRINGS LIMBERNESS TO STIFF JOINTS

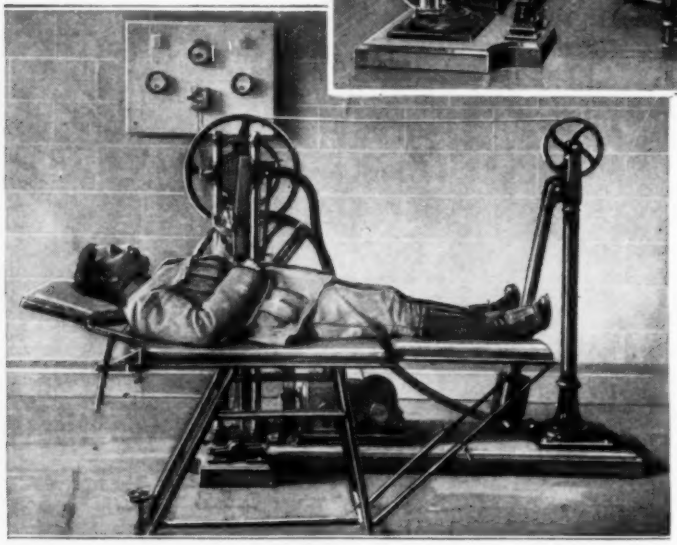
Stiff arm or leg joints caused by injuries or infectious diseases are now being brought back to normal by the use of a gymnastic apparatus, designed by a noted French physician. The machine is motor-driven and is so geared, operated, and counterbalanced as to impart the exact natural motion to the joint. The attachment for holding the injured joint is located on two supporting rods, where it can be locked into position at any level. As the machine runs, the attachment works the injured joint back and forth until normal action is attained. In order to avoid the excruciating pains suffered when such stiffness is treated by massage, the machine is regulated to cause a very slight movement of the joint at first, gradually increasing it until full normal motion is restored. The curative effect on the joint is both positive and speedy. Between treatments on the machine, natural healing takes place and aids in the final recovery, which, the specialist claims, in most cases occurs within a month.



Stiffened Joints Caused by Injuries or Infectious Diseases are Brought Back to Normal by This Device. It may be Adjusted to Move the Several Joints. The Patient Above is having a Stiffened Wrist Treated



The Picture Below Shows a Patient in a Reclined Position for Elbow or Shoulder Treatment. The Injured Joint is Held Positively by the Locking Device of the Apparatus



How the Ankle Joints are Worked: The Motion Is First Very Slight and Increases Gradually to Minimize Pain. Nature Works between Treatments and Cures Are Almost Always Certain

COMMENT AND REVIEW

[These pages were printed May 26, 1921.]

FORGETTING for the moment the imminent Japanese peril—and for how many years it has been "imminent"!—the Senate had the good sense the other day to say "No" to the initial appropriation for a $150,000,000 naval base at Alameda, Calif. This occurrence, even though the vote was only 30 to 40, permits hope in the minds of mere citizens that a start has been made toward sanity in considering appropriations for military purposes. Not only have the overburdened taxpayers been protected to the extent of $150,000,000, but the moral effect upon other nations, who regard our every move, will be helpful. It is worse than childish to talk world peace and go on leading the procession with appropriations for warfare.

Let Us Give Thanks

Like the other countries, we have our peace party and our war party, and the war parties see nothing, hear nothing, and smell nothing but powder. They talk as confidently about the "next war" as though the cause had arisen and the fatal day were set. While it is well to be reasonably prudent, we all remember the man of 80 and the continuous troubles of his life—most of which never happened. Profiteers in Japan are fattening on the contracts which the war party provides, and, naturally, they spread the gospel of hate through a well subsidized propaganda service. This action of our Senate reaches out like an olive branch and will hearten the peace party there, who will find in it confirmation of their contention that it is needless to arm against the United States. A very little smile often leads to understanding and warm friendship, and a very little frown may as easily lead to enmity. At a distance, one may even be mistaken for the other.

As for the average citizen, he would like a chance to pay off the notes he gave in order to buy Liberty bonds, before being taxed for a vast military policy.

WHEN the early pioneers settled in the state of Indiana, they found vast forests of the most magnificent black-walnut trees in the world. The black walnut flourishes on a rich soil, and by the settlers the great trees were regarded merely as a barrier to the farms of which they dreamed. So the ax was swung from early light until darkness set in. A pitiful portion of this noble wood found use in building log cabins, barns, and rail fences. The rest of it was piled and burned in huge bonfires. It has been estimated that the walnut, so ruthlessly consumed, would today be worth for manufacturing purposes a great deal more than the value of all the crops which have been raised on the land so cleared during all the days from then until now.

Wood as a Crop

In other states our forests were rapidly swept away, not with the same unthinking waste, it is true, yet largely as if one ate the heart of a melon and threw the rest away. Late, but better than never, we are now applying scientific experiments in a frantic endeavor to replace even some of the lost treasure, and we find Nature, like an offended host, withholding her former hospitality. Endeavors to replant with the same species are met with many discouragements, and we begin to realize how little does time count in the processes of nature.

Cement, brick, metals, plaster, and paper have been enlisted freely as substitutes for wood. In some cases the substitute has proved even better than the original—while in others search is being vainly made. Paper from wood is one of these, for while paper, and of excellent quality, has been made from all sorts of raw materials, some of which provide an inexhaustible supply, nothing has thus far developed which in the combination of quality and cost compares with spruce. If the substance is good, the cost is too great; if cheap, then the quality of the paper is too low. While little is ever heard of the nation-wide efforts, still the search goes on continually; one paper company alone has had 16 chemists working for a long time in its own plant, seeking a solution of an alchemy as precious as the transmutation of lead into gold.

The statement is now made that the failure to reforest devastated areas is due to the planting of trees whose strains have been inbred for centuries. A few years ago the proposal to crossbreed trees would have been scorned. Not so today; and the prediction is made that by crossbreeding, it will be practical to grow a

tree for pulp in 10 years which now requires 50 years. It is expected at least 25 years will be necessary to reach that point, but that it will come eventually.

And when that day arrives, millions upon millions of acres of land, at present worthless, will be planted to trees, cultivated, and harvested with as much certainty and regularity as oats are now.

A Humane Execution

THIS is not an argument for or against capital punishment, but merely a comment upon the new method of inflicting legal death as determined recently by the state of Nevada. Nevada has at least endeavored to be accommodating, and for a long time gave the condemned his choice of the rope or a firing squad; in either event the duty of the sheriff was very unpleasant. In the firing squad one cartridge was supposed to be a blank, to give each member a chance to feel his was the harmless one, yet none could escape the suspicion that his shot had been deadly after all. Even so, it had several advantages over hanging, as every one realizes who ever witnessed an execution of this kind. Too often the condemned, almost more dead than alive, has to be carried bodily to the platform, and propped up in a chair until the trap is sprung. Hanging was in vogue when it was the penalty for stealing a sheep, and was intended, by its very hideousness, to put the fear of the law into the hearts of all beholders. But it was seldom humane; so much depended upon the skill with which the noose was adjusted, and this takes experience. What with frequent elections and new officials, few had opportunity to become reliable administrators. With the knot at a certain vulnerable spot, a quick jerk of the falling body will break the neck, causing instant death. But necks, like sheriffs, differ, and the solar plexus of the neck cannot be located with a tape measure; moreover, the nervous executioner, anxious to have the ordeal over with, is often clumsy, with the result that the victim not only pays the penalty of his life, but instead of sudden death, he slowly strangles, which requires several minutes—an ordeal hardly less terrible for the witnesses than the prisoner. One who has witnessed four executions by hanging, tells me that in only one case was the neck broken and death instantaneous; in each of the three other executions the condemned slowly strangled in torture too awful to describe, and yet the same sheriff officiated in each case.

Anyone at all familiar with the various forms of execution which have been used in this country could not hesitate a moment between such a death, or the bloody, noisy firing squad, and the new Nevada way, in which the relentless hand of the law steals in tenderly and unrecognized. And yet, certain writers have worked themselves into almost a frenzy, with pictures of terrified days and sleepless nights and "tortures of the imagination." The Nevada law provides for a death chamber where the condemned is to be confined for from 60 to 90 days. At some hour after the 60 days, preferably while asleep at night, an odorless gas, which causes no pain, which cannot even be detected, is let into the chamber, and death occurs without a suggestion of discomfort. The condemned simply sleeps on or falls asleep and does not awaken.

These writers with the vivid imagination and more anxious to make a sensational story than calmly consider the actual facts, picture the mental agony of coming death because the exact moment is unknown. Yet, each of us who reads these words must die, although we do not know how or when. Yet the thought of the inevitable, when we do think of it, does not destroy our happiness nor change our plan of life. The psychology of the death chamber partakes of this, even though the method and the approximate time are known.

Hundreds of cases are in evidence where the condemned hoped for, and many counted on, a reprieve which never came. The gas chamber does not withhold that hope. The most desperate criminals usually display the least nerve, and are most fearful of physical suffering: the gas chamber promises a painless death. The gas execution will be found to cause the prisoner the least apprehension possible. The first few weeks he knows he is immune, and by that time the end still seems afar off. The hearty breakfast which most to-be-executed men demand, indicates how easy it is to divert the mind from the great event to trivial things.

The gas can be counted on to accomplish its mission a day, or several days, before the condemned anticipates his end, with the chances that on the fatal night he will find his pillow as soft, and sleep as welcome and undisturbed as the many

nights previous, from which he awoke. The element of fatalism is inevitable, and a submission to "what will be, will be." The state of Nevada deserves the thanks of her sister states, and those which still have nothing better than a rope should humanely follow her example.

The Air Mail

DISCOLORED with smoke, deeply burned on three edges, what remained of a once large envelope, the postmark still readable as San Diego, Cal., May 3, reached our office on May 12. A rubber-stamp explanation conveyed the brief information, "This letter salvaged from air mail plane, which was destroyed by fire at Rock Springs, Wyoming, May 5, 1921." What the notice failed to tell was that the pilot, W. B. Bunting, lost his life in the wreck and fire.

Progress in the transportation of mails has ever been at the price of human life. The runner, the rider, the stagecoach driver, each had his perils from Indian and bandit. Ever since the railway post office was started, the mail car has occupied a relatively dangerous position in the train. Many can remember when almost every issue of a daily paper carried the account of a train wreck somewhere and the injury or death of the mail clerk. Air brakes, better roadbeds, stronger bridges, and safeties-first have now combined to rob the work of a great part of its former dangers. But running true to form, our air-mail service seems to have inherited all the risks to life and limb which characterized previous systems of transportation. Admittedly, we are away behind other large countries in our air standards; we—who gave the others wings—ourselves frequently flutter, and flop and perish in the attempt to carry a few pitiful mail sacks. Letters post-marked "air mail" have already lost their novelty, nor has it yet developed to a point where there would be a great public outcry if it were suddenly withdrawn. The expansion and perfection of the telephone has, in fact, relieved the mail service of a great part of what was formerly "rush" matter.

With our backward position in international aviation it behooves us to cultivate to the utmost any and all avenues which lead to good machines and good pilots. While the air mail (which has frequently been several days slower than the railroad mail) does not yet fill a long-felt want, it should be the foundation for a service at once dependable and the swiftest. Thus far the pneumatic-tube service divides honors with the plane for speed; yet the cost of a tube of any considerable length, say Chicago to New York, is prohibitive.

What is there then about mail carrying which makes the undertaking so perilous? As far back as 1910 to 1913 the Germans operated a line of Zeppelins (see "Arise America"), which traveled 88,100 miles, carried 26,430 passengers and crew, without a fatality or injury. This, too, was 10 years ago. The passenger air service—planes—between London and Paris is as regular as the trains and boats, and as safe; the passenger service between Key West and Havana has operated now daily for several months without a death, and scores of planes at dozens of winter and summer resorts carry thousands without killing a passenger. Why, then, is it that when a few hundred pounds of mail are substituted for often a heavier load of passengers, the risk becomes so much greater? In less than four months eight pilots have lost their lives while flying mail planes. What is the answer? Either the mail pilots are grossly careless of their own lives, where the passenger pilots use every caution, or else the machines are unsuited to the work. Against this, look at the heterogeneous assortment of planes represented in the resort flying fleet. Do the passenger planes receive better inspection and repair? If so, why? Whatever it is, the Post Office Department should lose no time in arriving at the cause which is responsible for two deaths a month, against ten times as many planes flown in other business, in safety.

H. H. WINDSOR

LABOR AND THE SALES TAX

Following is an editorial from the Chicago Daily News of May 26, 1921:

"On behalf of the American Federation of Labor a representative of its executive committee has warned the finance committee of the United States senate that the adoption of a sales tax would be followed by indignation meetings all over the country, as organized labor is bitterly opposed to the shifting of the burden of war taxation from the shoulders of the wealthy to the backs of the toilers and the unemployed.

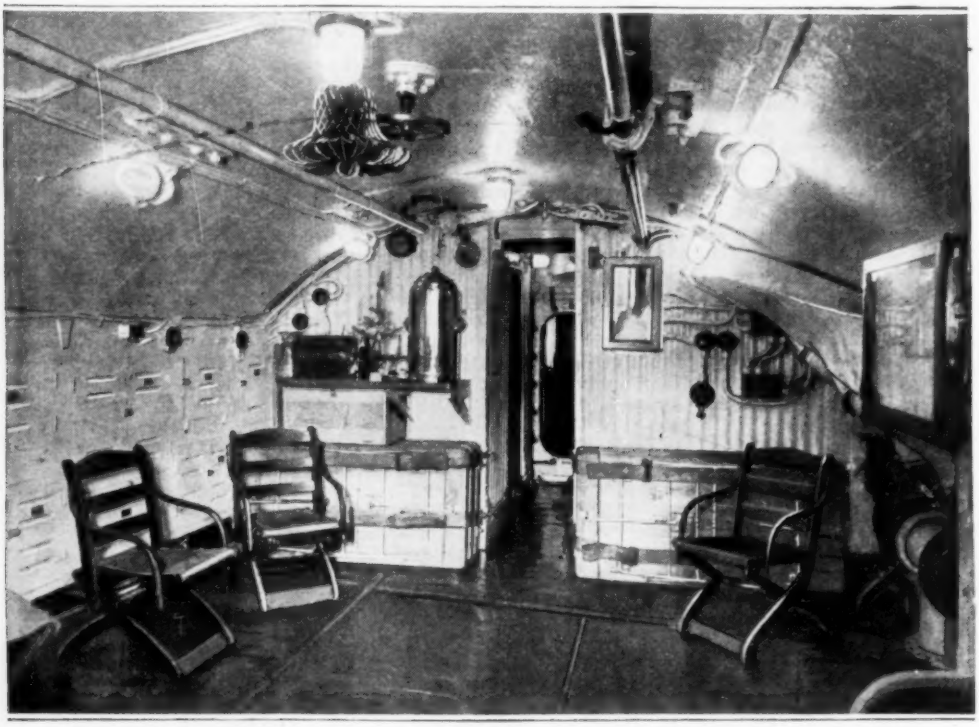
"The senate committee cannot have been greatly impressed by this threat. Some of its members in their examination and cross-examination of witnesses have shown a clear understanding of the sales tax and its incidents and have vigorously challenged the assumption that it would shift the burden of taxation from the rich to the poor. That assumption, of course, is fallacious.

"Who pays the excess-profits taxes and the other heavy war taxes? If 'wealth' pays them why the outcry against profiteers and high prices? If crushing taxation is largely responsible for the high cost of living and for unemployment—and sound economists admit that it is—how would the substitution of a sales tax injure the workers and the unemployed? Taxes now paid indirectly might then be reduced and paid directly in many instances; men and women now idle or working only part time might be enabled to earn a living.

"Cannot these labor leaders who are so aroused by the suggestion of a small tax on sales see that they are begging the question in all their arguments? The sales tax is advocated by many solely because it would lighten the burdens of the wage workers and the great body of consumers. No one proposes to add a penny to the taxes of the poor or to relieve the wealthy at the expense of the poor. The relief sought is relief for business, for industry, for the men and women who pay taxes in various disguised but none the less effective forms."

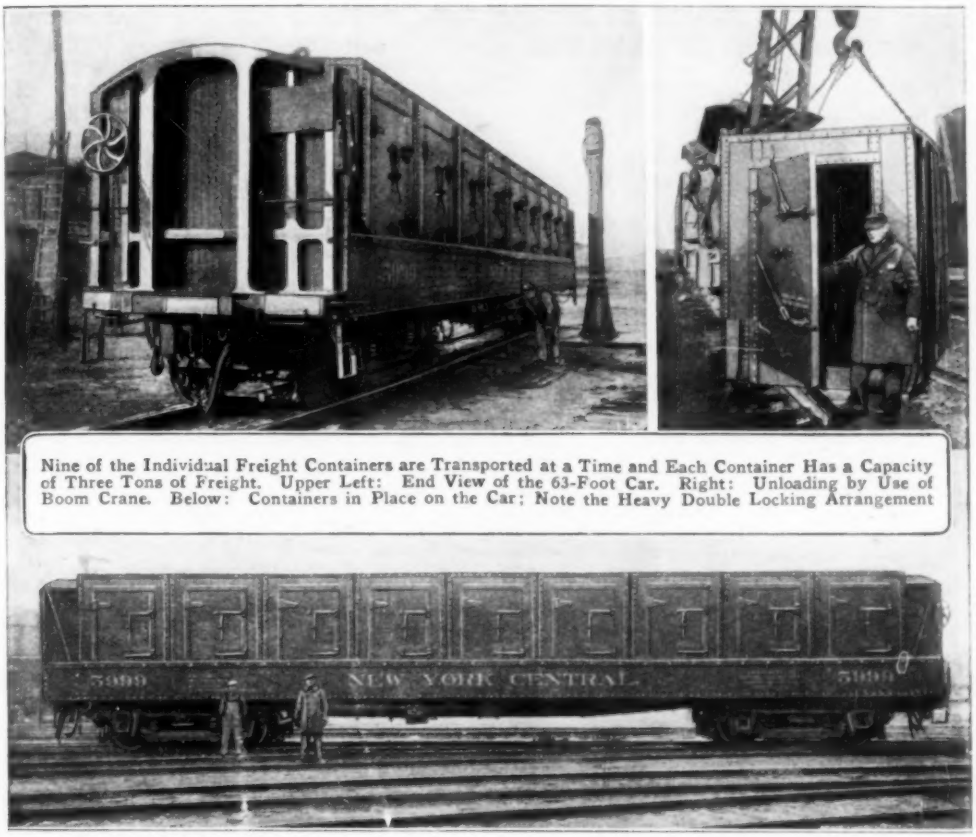
TURTLE AD STIMULATES EARLY COKE-SUPPLY PURCHASE

In order to stimulate the early purchase of the winter coke supply, one eastern gas company has adopted a very clever advertising scheme. Four large turtles on the backs of which one letter of the word "coke" was painted, were set at large in the company's display window. An award of a ton of coke free of charge was promised to the person who could spot the rambling reptiles when they were lined up in proper succession to form the word "coke." Hundreds of people have watched the turtles, and only one so far has been able to win the prize, but the exhibit otherwise served its purpose and many orders were booked.



ROOMY AND COMFORTABLE CREW'S QUARTERS ON NEW U. S. SUBMARINE

SPACE is the most precious commodity on a submarine. In those of past construction there was often hardly room for a man to turn around anywhere but in the conning tower. In the latest U. S. submarines, the quarters below deck for the officers and crew are as commodious, and as well lighted and ventilated, as they are in many a small vessel afloat, such as a destroyer, or a subchaser.



Nine of the Individual Freight Containers are Transported at a Time and Each Container Has a Capacity of Three Tons of Freight. Upper Left: End View of the 63-Foot Car. Right: Unloading by Use of Boom Crane. Below: Containers in Place on the Car; Note the Heavy Double Locking Arrangement

STEEL FREIGHT CONTAINERS MOVED ON MONSTER CAR

The individual freight container which has been utilized for some time as an aid in reducing loss and damage, has recently been adopted and approved with a modification in the container transportation, by the New York Central Railroad. The car used by other systems, similar to the one described in the February, 1921, issue of Popular Mechanics, was of ordinary standard specifications, while the car adopted by the New York Central road is 63 ft. long. It has sufficient space for the accommodation of nine containers, each of which is 6 ft. wide and carries three tons of freight. Double locking arrangements prevent theft and accidental opening of the doors. Inasmuch as the boxes are loaded direct to the trucks of the consignee from the special car at destination, freighthouse trucking and checking are eliminated.

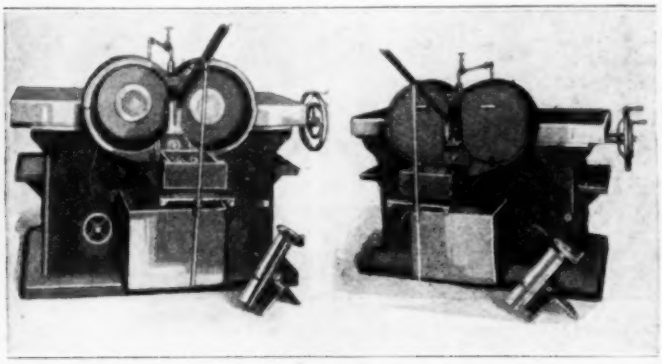
A use aside from that of carrying freight, is also being tried in which the container becomes a mail-carrying medium. A car of containers, carrying 27,000 lb. of mail, recently arrived in Chicago from New York as a trial trip, during which it was accompanied by postal officials who are to decide on its general adaptability to mail service. Decided decrease in mail thefts is expected from its use.

ISLAND NAVAL INSPECTION BY SEAPLANE

Airplanes are now utilized for covering wide territories in rapid inspection by naval officers stationed at the Hawaiian Islands. During a recent tour Rear Admiral Shoemaker completed a round-trip, sea-by-air route of 236 miles, in two hours 30 minutes, despite the fact that on his return he was obliged to face a heavy wind. A feature of the journey was the fact that constant wireless communication was maintained from shore to plane, enabling the admiral to engage in his routine duties as though he had been in his office at Pearl Harbor. Inspection of isolated territories will increase with the perfection of this service.

CYLINDRICAL PARTS GROUND WITHOUT USE OF CENTERS

Time and labor will be saved by a machine that grinds any cylindrical piece of work with speed and accuracy, without the necessity of having it set up in a lathe, or in any way on its centers. The grinding is done by means of two 16-in. wheels, a grinding and a regulating wheel, mounted on spindles so that their circumferences are nearly tangential. At this point is located a fixture that guides the work suitably, and into which it is fed by means of an inclined chute, underneath which is a projecting shelf for carrying a supply of the pieces conveniently for the operator. Under this shelf is a water tank into which the pieces are automatically dropped after being ground. The adjustment of the regulating wheel is by means of a handwheel. A centrifugal pump furnishes water to the work in the manner usual in grinders. There are accessories to suit different kinds of work.



Two Views of the Centerless Cylindrical Grinder, the One on the Left Having the Wheel-Housing Cover Removed, Showing the Two 16-Inch Wheels: In Front of the Machine is Seen the Inclined Feeding Chute

FLOW OF GUSHING OIL WELLS CONTROLLED IN 20 MINUTES

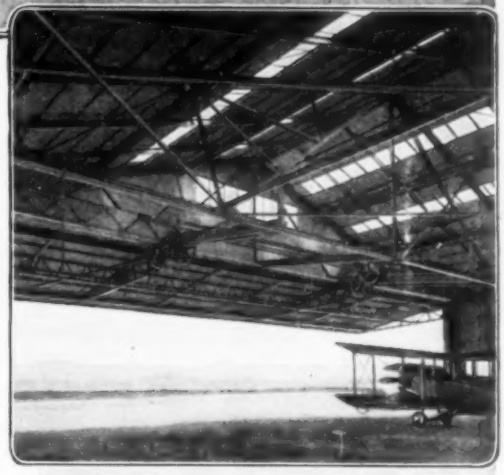
Gushing oil wells have hitherto been a cause of serious loss to operating companies, sometimes on account of waste of oil, at other times through the destruction of the derrick, and occasionally because of ignition of the oil. This loss is now prevented by a device that has been used for some time in California oil fields, which makes possible the complete control of the gushing oil. Within 20 minutes after the well starts to gush, it is brought under perfect control, and gushing is prevented. By means of a control casing head, with a top that can be brought up by the tools when they are hoisted into the derrick, the flow of the oil is stopped, and the gusher controlled.

BICYCLE ENGINE DRIVES FRONT WHEEL BY V-BELT

A complete power plant and V-belt transmission, which can be attached to any standard bicycle to convert it into a motorcycle, consists of a 1-hp. air-cooled engine, a gasoline tank, a bicycle wheel, fitted with a grooved pulley and equipped with a tire, and a steering fork. All that is necessary to make the change is to remove the old steering fork and wheel and replace them with the new ones. The engine and fuel tank are carried above the wheel, the power being transmitted to the pulley by the V-belt. Ignition is by a high-tension magneto built into the engine flywheel. Levers on the handlebars control the throttle and release the compression for easy starting. A speed of 26 miles an hour and a mileage of from 100 to 150 miles to the gallon of fuel are claimed for the device.

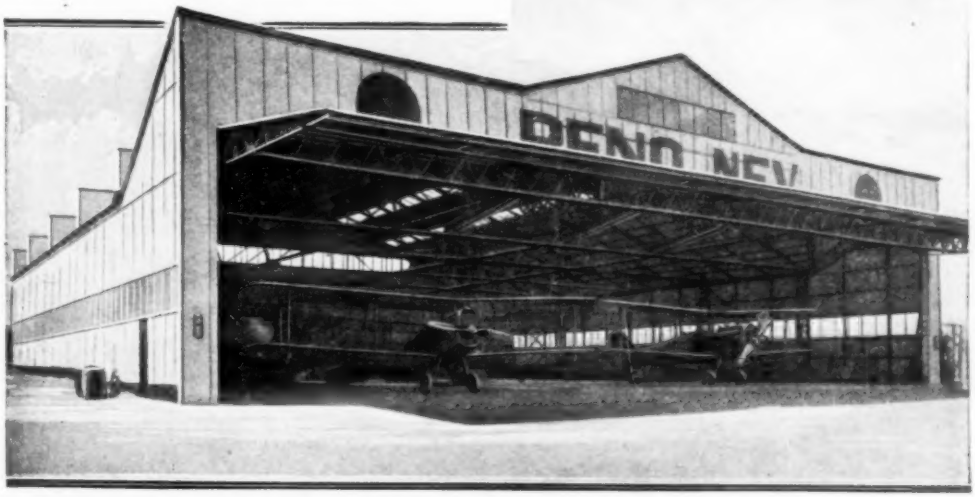
The New Bicycle Engine Hangs over the Front Wheel and is Equipped with a V-Belt Transmission. Right: Close-Up

HANGAR DOOR OPERATED LIKE BASCULE BRIDGE



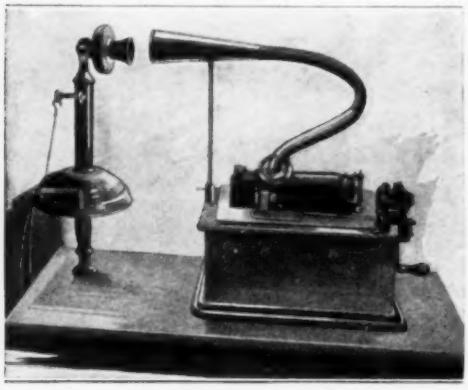
THE outstanding feature of an eight-machine hangar recently erected by the city of Reno, Okla., to house airplanes of the Postal Aerial Service, is the immense bascule-type door, the largest structure of its kind in the world. This mammoth gate, the result of months of study on the part of a Chicago, Ill., structural engineer, is 100 ft. long, 21 ft. high, and being of steel-beam and corrugated-panel construction weighs 12,000 pounds.

The problem of quickly and easily moving such an immense weight was solved by adopting the bascule method of suspension, hanging the big panel from pivots at the top in such a way that it swings outward and upward and balancing it with a 37,500-lb. counterpoise inside the building. The plan was a complete success, and so perfect was the designing that a 5-hp. electric motor, turning a series of reducing gears, lifts the huge section to its full opening in 20 seconds. The view above shows the door closed, hanging on its trunnions like one leaf of an inverted bascule bridge. This is revolved 90°, with the result shown below. To the right is an interior view of the hangar, looking outward through the open doorway.



NEW BURGLAR ALARM PHONES TO POLICE DEPARTMENT

Buzzers, clanging bells, glaring lights, and many similar contrivances have been utilized to announce visits from the burglar, but an alarm that calls up the police and tells them what is wrong and where to go, is the latest of these mechanisms. Wire connections from the doors and windows of the house, lead to an electrically operated phonograph and telephone-receiver release. When the windows or doors are opened, an electric impulse is transmitted simultaneously to the phonograph and the receiver mechanism. The former starts calling into the telephone the house number and street of the victim. The telephone operator relays the call to the police department.

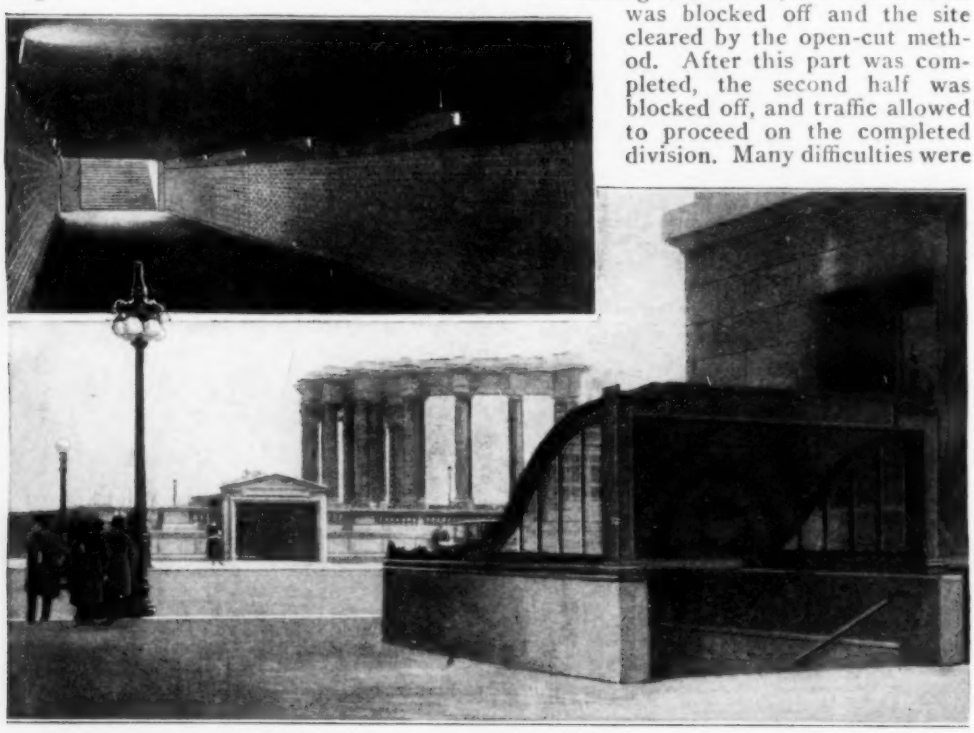


When the Burglar Raises a Window, an Electric Impulse Starts the Phonograph and Lifts the Telephone Receiver. The Phonograph Calls the Police

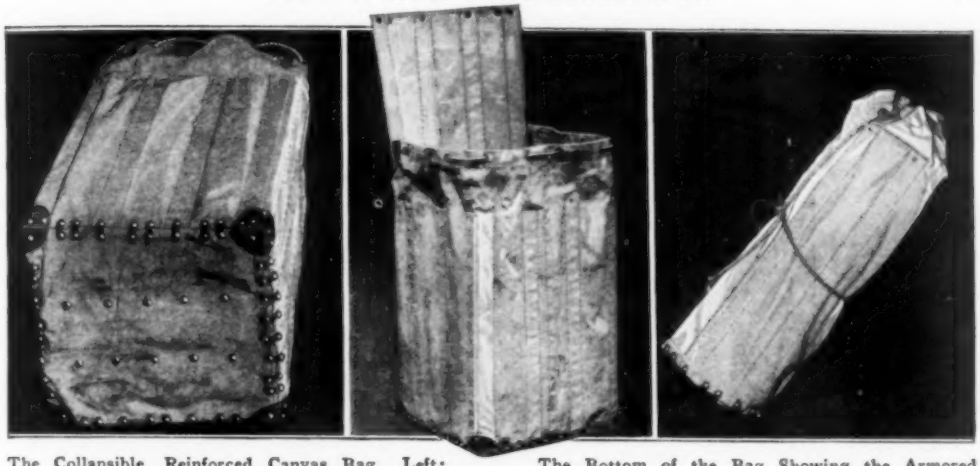
CHICAGO STREET TUNNELED TO PROTECT PEDESTRIANS

Through the recent completion of a bridge across the Chicago River between the north and south sides of the city, Michigan Avenue, of which the bridge is the connecting link, has become the busiest auto road in the world. Approximately 30,000 commuters using the Illinois Central Railroad have heretofore been obliged to cross this busy avenue at its important Randolph Street intersection, and as a protective measure for these pedestrians, as well as to speed traffic on the street above, a tunnel under the avenue has been constructed.

In building this tunnel, half of the street was blocked off and the site cleared by the open-cut method. After this part was completed, the second half was blocked off, and traffic allowed to proceed on the completed division. Many difficulties were



Entrances to Tunnel under Chicago's Busiest Auto Thoroughfare, Michigan Avenue. Upper Left: Interior of the Tunnel. The Lights Operate Automatically



The Collapsible, Reinforced Canvas Bag. Left: The Bottom of the Bag Showing the Armored Corners and Heavy Rivets for Holding the Reinforcing Slats in Place. Middle: Opened to Receive the Freight Content. Right: Rolled Up and Bound by the Draw Cord Preparatory to Returning to Its Sender

encountered, including the removal of electric service lines, water-main changes, the depression of a sewer, and surrounding the tunnel by a water-tight envelope. The passage is 146 ft. long, 16 ft. wide, and 8 ft. high, and is fitted with a bilge-pump-emptied sump for flushing it out. It has been constructed in contemplation of a new terminal at Randolph Street which will be located a little east of the eastern end of the street, and to which the passage will ultimately be extended.

AUDION-BULB PROTECTOR IS ECONOMICAL FITTING

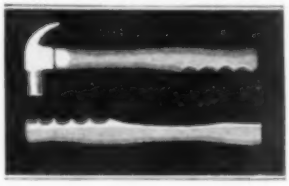
Audion bulbs used on radio sets are costly and very easily burned out. Overloads and short circuits quickly put an end to their term of usefulness. A lately devised fuse, which is especially adapted for use in connection with radio equipment, will eliminate these losses. This fuse is made of the usual materials, but differs from other fuses in that it fits over the filament that leads to the bulb. In case of a current overload, it blows out and checks the destructive effect to the more fragile parts of the bulb. It does not reduce the efficiency of the radio outfit, and is easily removed when changing becomes necessary. The cost of the fuse is moderate.

REINFORCED COLLAPSIBLE BAG NEW FREIGHT CONTAINER

Cartons, cases, boxes, and bags of various kinds have long been utilized as the customary means of protecting commodities in shipping, but the latest thing along this line is the reinforced collapsible canvas bag. The reinforcement consists of wooden slats which may be removed when broken or worn. The bottom is a flap attached to the lower edge of one of the sides, and may be pulled into parallel position with the side when folding is desired. To inclose the contents, a draw rope is provided in the upper portion of the bag. This rope is also used to tie the unit when rolled up, after it has been emptied at its destination, for returning to the sender.

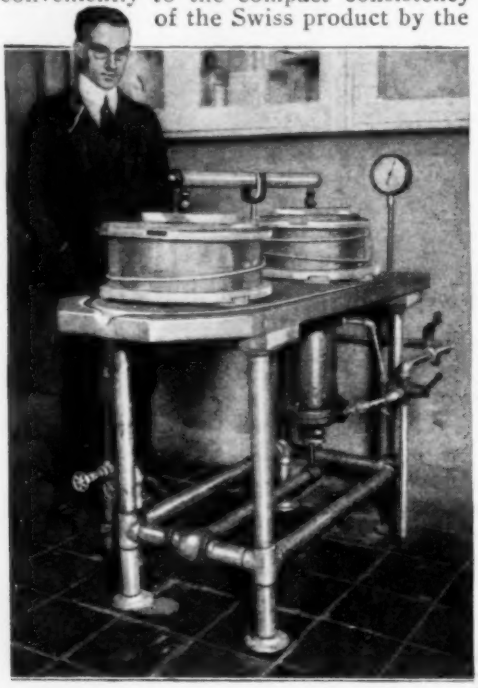
NOTCHED HAMMER HANDLE ASSISTS TIGHT GRIP

Oily and wet hammer handles have not only been an obstacle to speedy and accurate work, but have often been the cause of serious accident as they have slipped from the grasp of the user. A notched hammer handle is now designed with which it is expected to do away with such difficulties. The under surface of the handle has four arc-shaped notches in which the fingers rest. The opposite side is slightly curved to receive the palm of the workman's hand.



POWER PRESS AIDS IN MAKING SWISS CHEESE IN AMERICA

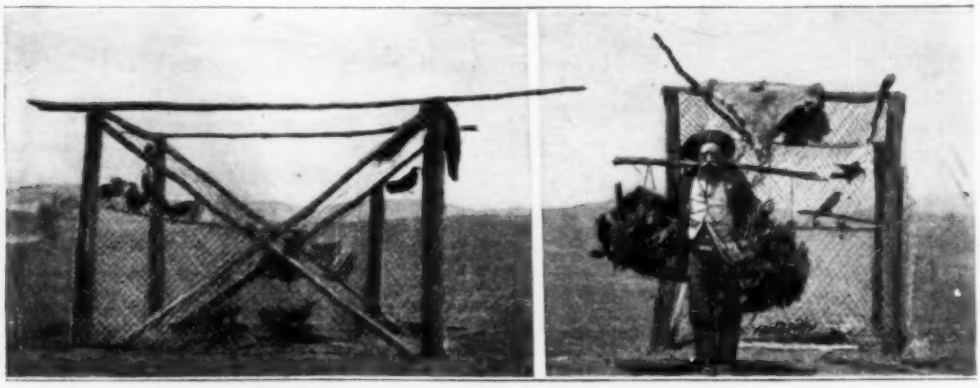
American cheese may now be pressed conveniently to the compact consistency of the Swiss product by the use of a hydraulic press recently designed, which is built of heavy pipe and capable of pressing two bricks of cheese at a time. The cheeses are laid under two iron knobs attached to the ends of a crossbeam centrally poised on a pull-down rod above the table, and the pressure is applied by the action of a hydraulic cylinder below the table. As the piston is driven out of the cylinder, a series of rods are brought into play in such a way as to operate the pull-down rod, which causes the crossbeam knobs to make forceful contact with wooden disks placed on top of the cheeses. After several turnings in the press, the cheese is allowed to stand for 24 hours and is then ready for the market. The hydraulic cylinder is capable of developing 30 lb. of pressure to the square inch, but 10 lb. is sufficient to do the work.



Placed in This Hydraulic Press American Cheese is Compacted to the Consistency of Swiss Cheese. A Pressure of 30 Pounds per Square Inch is Used

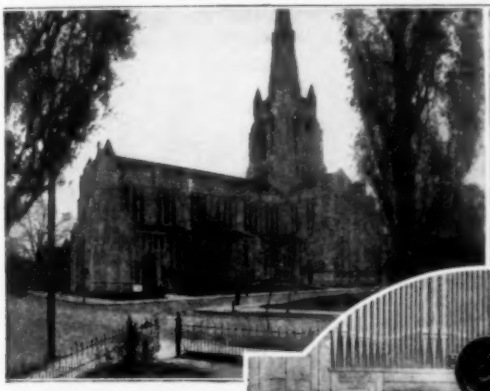
AN AUSTRALIAN'S CROW TRAP CATCHES CROWS WHOLESALE

Like all carrion-eating birds, the crow is very voracious, and this trait is the means of its own undoing. The farmers of New South Wales take advantage of it by baiting traps with lamb's meat and sheepskins. They have an ingenious form of crow trap made by driving into the ground four corner posts, about 7 ft. high, with a pair of saplings arranged diagonally and connecting them at two sides of the rectangle formed by these posts. At about the center of the trap, where these diagonals cross, there is secured horizontally a ladderlike series of perches. At the top of the posts is a frame, also made of saplings, from which hangs a net which stretches between the diagonals across the center of the trap, and also surrounds the four sides. The bait is placed on the ground inside this network, and thus the crows can get into this net and find all they want to eat, but at the cost of their lives, for they cannot get out of the net again. A trap of this kind sometimes will catch in one day as much as a man can conveniently carry away.

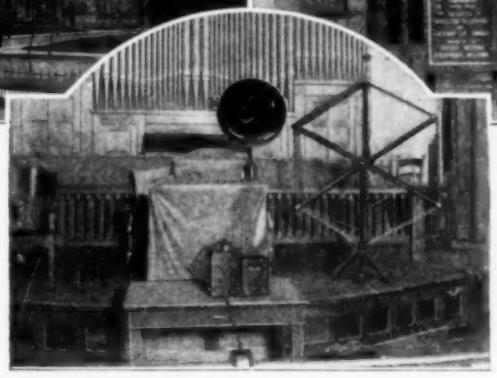


Left: View of the Trap with Crows inside It. Right: The Trapper with One Day's Catch, Which Is So Large That He Needs a Shoulder Yoke to Carry It. A Couple of Crows are Left in the Trap as Decoys

PASTORLESS CHURCH HEARS SERVICE BY WIRELESS



The Calvary Episcopal Church of Pittsburgh from Which Sermons and Music were Sent by Wireless to a Church in the Same City



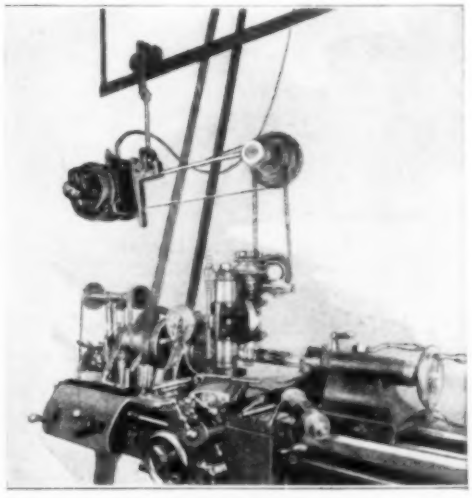
The Connecting Wireless Outfit between the Pastor and Choir of the Calvary Episcopal and the Congregation of the Herron Presbyterian Churches: A Loop Antenna and Condenser were Used

The Herron Avenue Presbyterian Church, Pittsburgh, for Whose Minister and Choir a Wireless Transmitter in Another Church Substituted

The day may soon come when the itinerant minister will be a thing of the past. The inconvenience of trying out substitutes and candidates is also destined to leave with the broadcasting of church sermons and music by wireless. The Herron Avenue Presbyterian Church of Pittsburgh, which had been without a pastor for some time and compelled to rely on substitutes, decided upon the installation of a wireless-telephone receiving outfit in the pulpit. The outfit was a compact arrangement of loop antenna, amplifier, and condenser, and it was the means whereby the interested congregation listened to a service from the Calvary Episcopal Church of the same city. Although the speaker differed in creed from his auditors, attentive ears received his sermon as transmitted by the wireless.

THREE MACHINE TOOLS IN ONE BY ATTACHMENTS TO LATHE

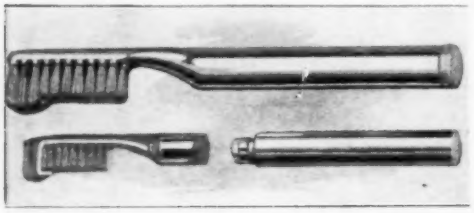
A lathe, a universal milling machine, and a grinding machine, all in one, and convertible at will, is made possible by a set of attachments that have been put upon the market recently. Besides the milling machine, there is a dividing head that operates through a gear bolted to the back of the chuck, and which divides accurately any work held in the lathe. The grinding attachment does internal and external work accurately. These attachments are driven by a motor hung from a trolley on a track above the lathe, so that it follows the work in any direction. It delivers 12 speed changes, from 24 r.p.m. to 350 r.p.m. on the milling spindle, and up to 13,000 r.p.m. on the grinding spindle. The limit of the work is dependent upon the capacity of the lathe.



The Milling Attachment, in Operation on a Lathe, is Driven by the Motor Hanging from the Overhead Track

FOUNTAIN TOOTHBRUSH IS TIMESAVER

To eliminate a great number of petty inconveniences that generally go with

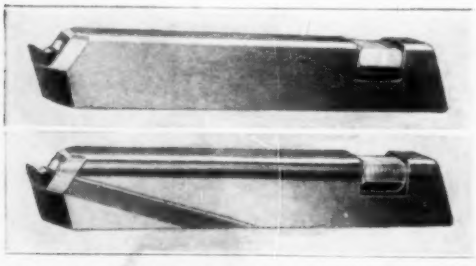


This Fountain Toothbrush Carries the Paste Tube within the Handle Barrel. By Turning the Knurled Collar at the End, the Paste is Forced into the Bristles

washing the teeth in the morning, a fountain toothbrush is practical. There is no hunting for tubes, unscrewing caps, scratching around for the brush, etc., for paste and brush are combined. Within the brush handle is a hollow compartment designed to carry a tube of paste. To wash the teeth, the bristles of the brushes are wetted and the paste from the inner tubes introduced to them by turning a knurled collar at the end of the handle, which forces it out. When empty, the paste tube is readily replaced.

WEDGE ACTION LOCKS CUTTERS IN NEW LATHE TOOL HOLDER

In an improved tool holder for use in lathes, shapers, and planers, the high-speed-steel cutter bit is held firmly by the wedge principle instead of being secured by a top-projecting setscrew, as in other types of holders. A steel stud, extending through the holder body near its top, is threaded at the rear end and slightly

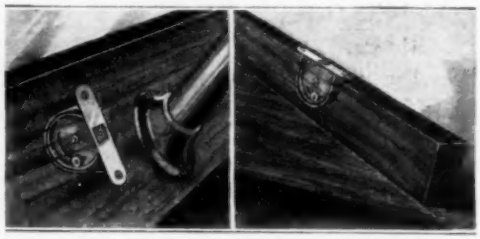


Above: The Holder and Tool Assembled for Use with Wedging Stud Screwed Tightly in Place. Below: Phantom View of the Wedging Stud Jammed against the Tool

beveled at the front. The cutter bit occupies a square passage running through the holder at an angle from top to bottom. With the bit in position, it fits against the bevel of the locking stud, and is locked tight by means of a nut on the threaded end of the stud which turns in and bears against the rear wall of a recess in the holder body.

GONIOMETRIC INSTRUMENT IS LEVEL AND INCLINOMETER

The goniometer is an instrument for measuring angles, especially the angles of crystals. There has now been introduced a goniometric level, which is an instrument for use as an ordinary level, and also for measuring the angle of any slope. At its center and partly exposed beneath a glass shield, is an oscillating wheel, graduated on its outer rim, and indicating the slope in degrees and fractions of a degree. Connected to this wheel is a weight which can be adjusted to compensate for any slope. By this means, when it is attached to the sloping dashboard of an automobile, it can be adjusted so that the

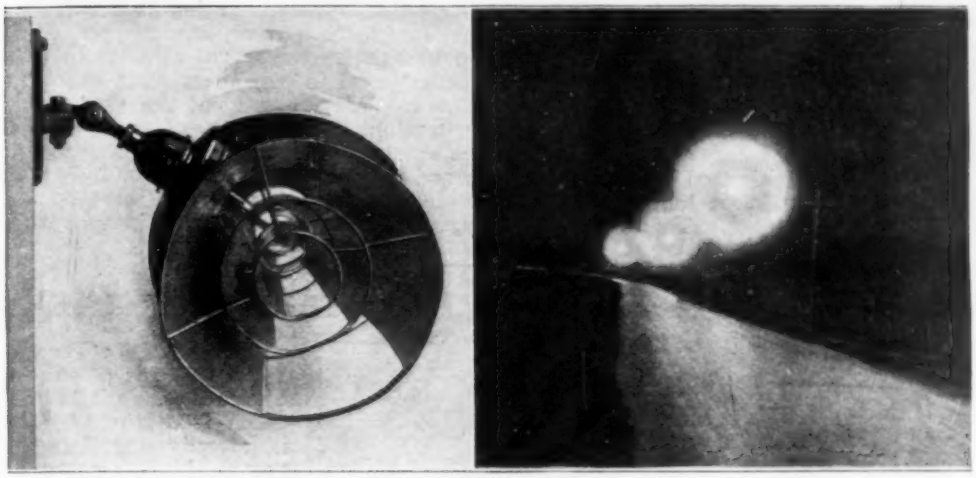


Left: A Phantom View of the Instrument on the Dashboard of an Auto. The Figures are Read through the Square Opening in the Plate That Fastens It. Right: A Combined Level and Inclinometer

wheel is at zero when the car is level. It will then indicate the grade of any road over which the automobile is traveling. Thus the instrument can be used as a level, as a plumb, or as an inclinometer.

NEW LACQUER MAKES BRASS PERMANENTLY TARNISH-FREE

A lacquer, the formula for which is withheld at this time for obvious reasons, will keep brass from tarnishing for an indefinite period, it is claimed. Various pieces which have been exposed to the most rigid of tests, have successfully withstood them. One piece was placed for a week in an oven at 250° F. and showed no discoloration when it was withdrawn. Furniture manufacturers and others are giving the lacquer a trial, and thus far nothing has been able to corrode or mar the parts covered. Where pieces are to be exposed for extremely long periods of time, two coats are advised.



The Multiple Reflectors of the New Street Lamp Collect All the Light and Cast It upon the Road Below. Left: A Close-Up of the Lamp Showing the Adjustable Base. Right: The Lamps along a Country Road; a 250-Candlepower Lamp is Carried in the Fixture

MULTIPLE-REFLECTOR FIXTURE BRIGHTENS COUNTRY ROADS

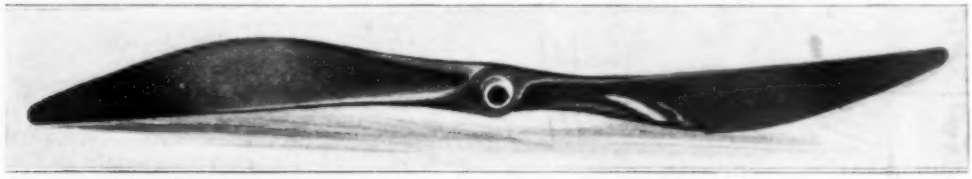
Despite regulations and dimming devices on auto headlights, fatalities are still piling up which are directly traceable to the glaring headlight. When a new multiple-reflector lamp is used to brighten dark suburban roads, the bright headlights will not be needed, and accidents attributable to them consequently will be reduced. Three reflectors, one within the other, compose a unit which collects all of the light and casts it upon the road. A 250-cp. incandescent lamp is located between the reflector units, which are in duplicate for spreading the light in both directions. To permit movement from side to side, the fixture is provided with an adjustable base.

CALCIUM SALTS ESSENTIAL TO GOOD NOURISHMENT

In a village of the department of the Ardennes, in France, it was observed that fractures of the limbs of both men and domestic animals became very frequent on account of an excessive fragility of their bones, caused by the absence of calcium salts in the drinking water. This confirmed the hypothesis of the hygienist Loew, that calcium salts are essential to good nourishment. He found that by adding to the amount of food consumed by the average person daily two to three grams of chloride-of-calcium salts the resistance of the bones to fracture was notably increased; and that fractures, when they occurred, were healed more rapidly. From this has originated a practice of making calcium bread by mixing five parts of chloride of calcium with 100 parts of flour.

MOLDED-FABRIC AIRPLANE PROPELLER IS WARP-PROOF

At best a makeshift, the wooden airplane propeller has outlived its usefulness, and is apparently about to be supplanted by a new-process part, built up of about 300 strips of strong cloth impregnated with bakelite. After having been cut to shape and saturated with the semifluid bakelite, the strips are placed in a mold and, under several tons' pressure and at high temperature, formed to a propeller

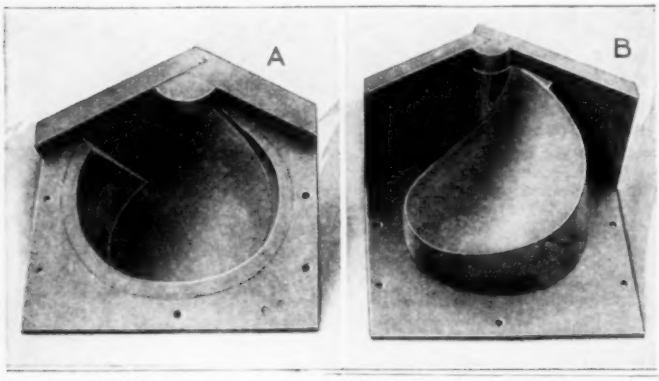


The Graceful, Highly Efficient Shape of the New Airplane Propeller Is Due to Its being Molded Instead of Built Up of Wood Laminations. Three Hundred or More Layers of Strong Cloth are Saturated with Bakelite and Pressed to Shape, in a Hot Mold, with a Hydraulic Press

shape, which it has been impossible to produce in wood owing to its grain. As the cloth can be cut at 300 or more different angles, the propellers may be thought of as having as many different grains or, being welded into a solid mass, they may be considered as being grainless.

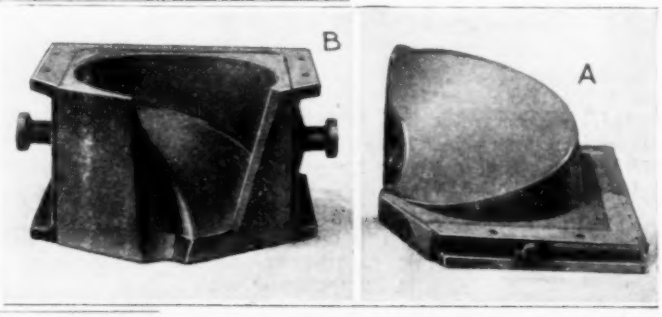
Bakelite is not affected by wide variations in temperature or humidity and is, therefore, warp-proof. This is a most decided advantage, as heretofore it has been necessary to build wooden propellers to be used in the warm climates in that locality, and to give them most excellent care in order to prevent the destructive distortion. The new propellers are said to be much stronger and more efficient than wooden ones, to have a smaller hub, and, owing to their elasticity, to increase and decrease in pitch with variations in load.

NEW, IMPROVED METHOD OF CASTING PROPELLERS

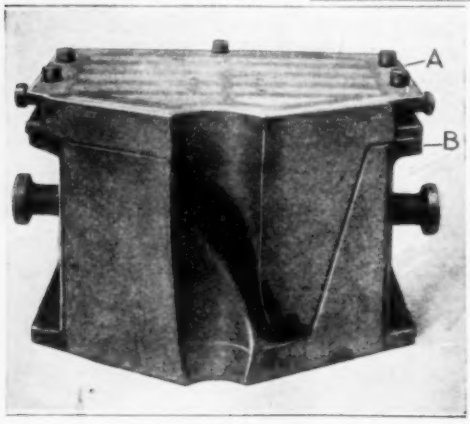


Of the Two Wooden Patterns Shown Above, A Is for Molding the Sand in the Cope, or Upper Half, of the Flask, and B for Molding It in the Lower, or Drag

A method of casting ship propellers has been developed, and adopted in some of the largest yards, which not only simplifies the manufacture of the propeller, but also adds to its efficiency. The casting is of such a character that when taken from the mold it is already finished—in the machinist's sense of the word—and requires no machining, chipping, or scraping, excepting, of course as regards the bore for the driving shaft. Thus, even the pitch of every blade is so perfectly accurate and true, that the propeller as it comes out of the mold is superior to those cast in the ordinary way after they have been machine-finished. Another gain is the saving of time, for by the new process a propeller can be cast and set in six hours, it is said. These results are obtained by the use of a novel method of molding, which will be best understood by referring to the accompanying illustrations.

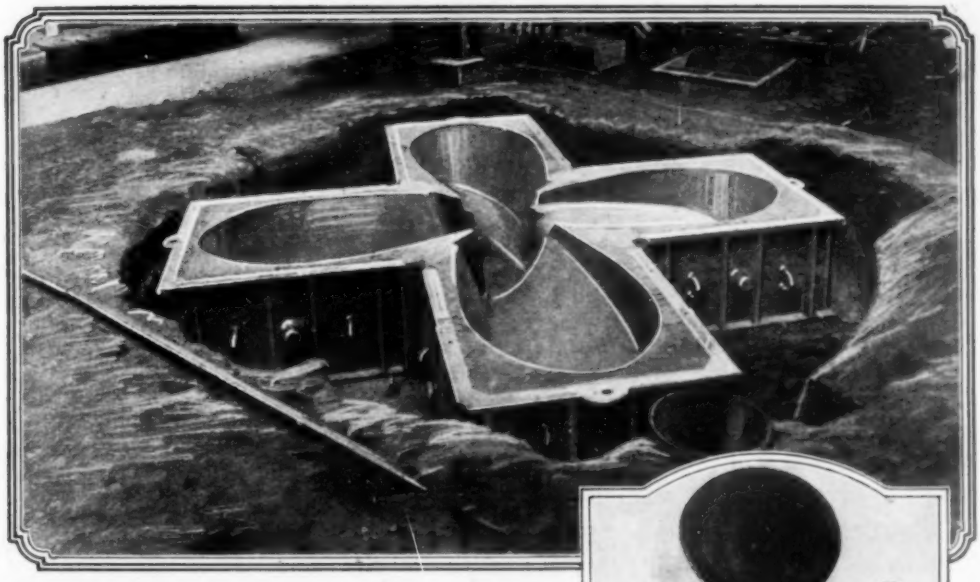


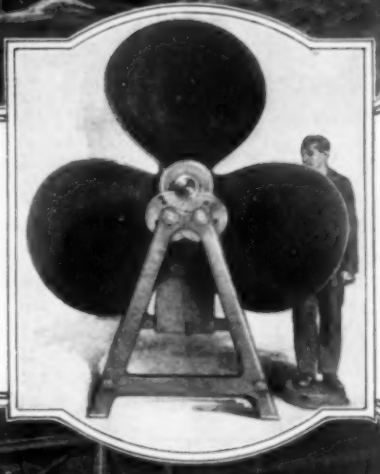
A Shows the Mold in the Cope Made by Use of the Pattern A, and B the Mold in the Drag, Made by Use of the Pattern B



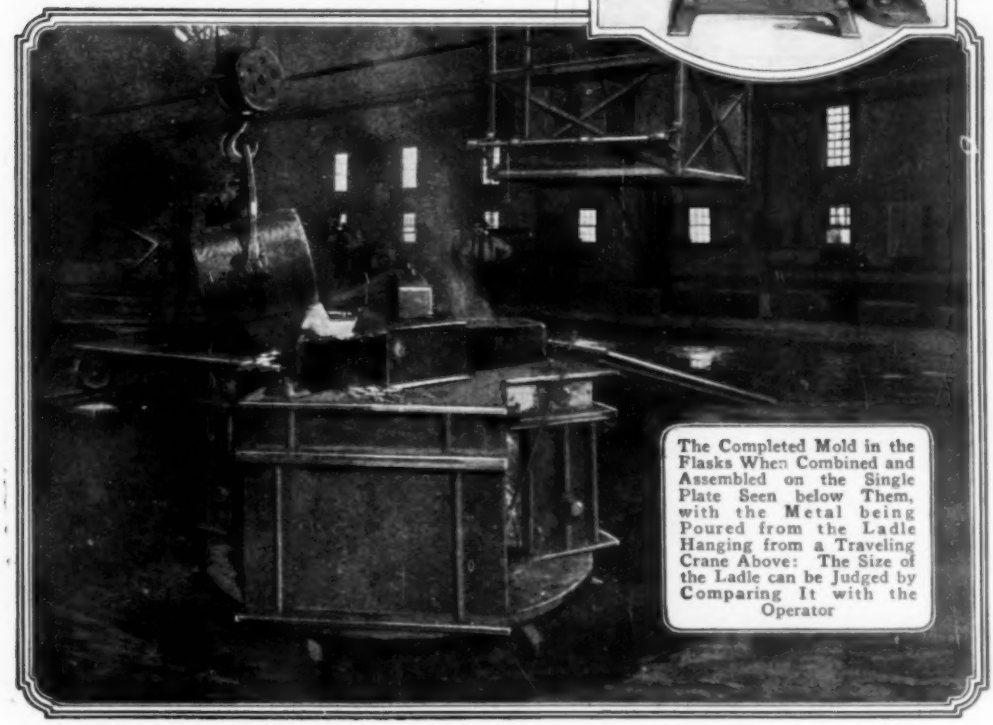
The Cope and the Drag are Here Assembled, Forming a Flask Ready for the Pouring of the Metal

¶A Washington State game warden electrified a curtain of water across an irrigation channel by charging steel piling driven into its bottom. Fish avoided the curtain.





Above: The Four Drags, or Lower Halves of the Flasks, to Form a Four-Bladed Propeller are Assembled in a Single Base Plate, Ready for having Placed upon Them the Four Copes, or Upper Halves of the Flasks. When Completely Assembled in This Manner the Mold will be Ready for Pouring the Metal. As the Molds in Each of the Four Flasks have been Made from the Same Pattern, All in the Same Manner, All Four Blades in the Casting must Be Exactly Alike. The Result is Shown to the Right, Where the Casting, after being Taken from the Sand, is Placed upon a Ball-Bearing Balancing Stand, to be Perfectly Balanced before Boring the Hub for the Shaft



The Completed Mold in the Flasks When Combined and Assembled on the Single Plate Seen below Them, with the Metal being Poured from the Ladle Hanging from a Traveling Crane Above: The Size of the Ladle can be Judged by Comparing It with the Operator

NEW CROSSING SIGNAL MAKES OFFICER A HUMAN SEMAPHORE

Traffic officers of New York City have been equipped with a new signaling device attached to a sleeveless canvas

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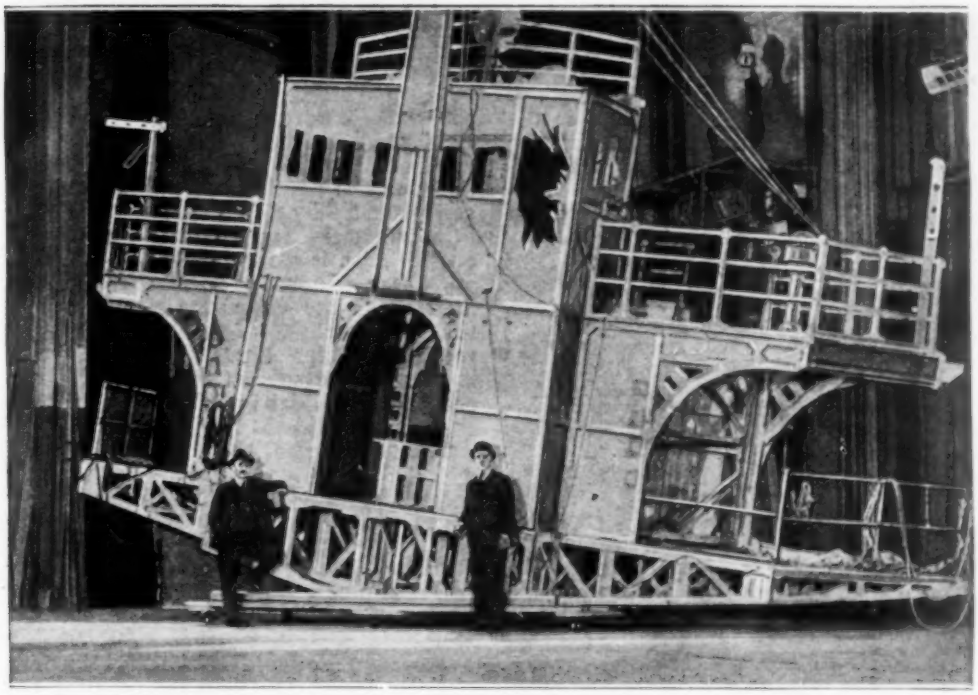
Three "Human Semaphores" of New York's Traffic Squad: Flashing the Red, Green, and White Lights Gives the "Stop" and "Go" Signals

jacket, which is worn over the uniform and forms a dead-white background for the apparatus. The signal proper consists of three lenses colored red, green, and white, which are illuminated by miniature electric lights. These are placed on the front of a light-weight box, worn on the officer's chest, and containing the battery and switches. The officers give the "Stop" and "Go" commands by turning to face the alternate traffic streams, at equally timed intervals, and by the correct manipulation of the lights. In the event of the commission of a crime, all traffic in both directions can be halted, thus avoiding confusion while search for the criminal is made.

MODEL OF VEHICULAR TUNNEL FOR EXPERIMENTAL PURPOSES

Plans have been made for a vehicular tunnel under the Hudson River, between New York and Jersey City, as stated in the January Popular Mechanics. It is to be twin-tubular, built of concrete. There is one feature in this projected tunnel that is unprecedented. The two air outlets at its central section cannot be brought nearer together than 3,400 ft. Tunnels as large have been built before, but never with such a distance between air outlets. This involves a problem in ventilation that has made necessary some very elaborate preliminary experiments, now being conducted at the University of Illinois. In order to ascertain with precision the amount of air that will be required, and the power that will be consumed in furnishing it, there has been constructed a model, 300 ft. long, containing a fan with an air capacity of 100,000 cu. ft. per minute, driven by a 300-hp. motor. The model, of course, is built of concrete, like the proposed tunnel, as one of the most important factors in the experiments is the friction of the air in the concrete tubes.

Right: Outside View of Part of the 300-Foot-Long Tunnel Model, Built of Concrete, for Testing the Five-Ton Fan, Shown on the Left, Which Is Capable of Blowing 100,000 Cubic Feet of Air a Minute, When Driven by a 300-Horsepower Motor



Rear View of the Ship's Bridge Used as a Stage "Set" in the Play "In the Night Watch": The Hole in the Wireless Room Above was Made by the Shell from the Gun of a Submarine, Also in the Set. Rocking was Accomplished with the Aid of Trussed Giant Rockers

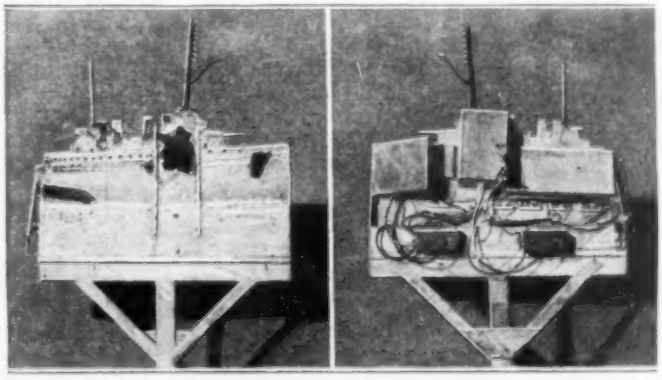
REALISTIC MARINE WARFARE ON STAGE

By HARRY A. MOUNT

THE scenic realism of the motion picture is approximated in a new stage play which has recently made its appearance in New York. The play, "In the Night Watch," was a London and Paris success before coming here, but the American production is outstanding by one of the most ingenious and realistic stage "sets" ever executed.

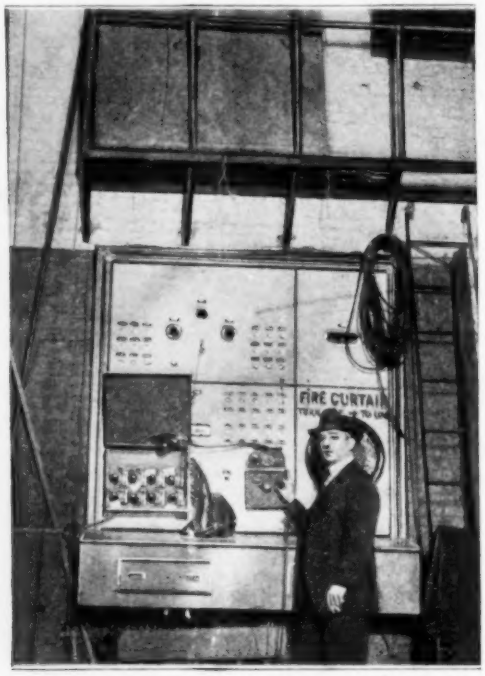
The set depicts every detail of a battle at sea between a French man-of-war and a German submarine; shows a shell from the submarine tear away part of the ship's bridge; the U-boat struck and sunk; and finally the warship's plunge beneath the waves. The spectacle is not only carried out in all the minutest details, but—what is unusual for a stage scene—it is most convincing.

Nearly the whole action of the play takes place aboard a French cruiser. The first scene represents a ball on its deck on the eve of war, with a canopy spread under the big guns of the forward turret. When word of war comes the guests are sent ashore, and in a few seconds the battleship is "cleared for action" and is transformed from a scene of gayety to a grim fighting machine. The turret and guns used in this scene are life-size and operate in a realistic manner.



Left and Right: Front and Rear Views of the Submarine in the Clever Stage Set: It Is in Miniature to Represent Distance, and Is a Network of Intricate Wiring for Light Effects

At the climax the boat is actually seen moving out to sea, although the stage, of course, remains stationary. This is accomplished by moving slowly toward the footlights sets which represent the projecting masts of other vessels lying alongside. Just as one often has the sensation



So Complicated Were All of the Cues and Instructions That the Stage Manager Used This Switchboard to Signal the "Night Watch" Stage Force

that a train in which one is sitting is moving while watching another train on the next track, so the audience is given the feeling that it is actually on the deck of a ship leaving its dock.

The second scene reveals a close-up of the bridge of the vessel at sea. A tiny boat which comes into view actually appears to be a mile or two distant, although but a few feet behind the main set. Signals are exchanged, and although the vessel appears to be French, it turns out a German submarine, and opens fire when within range. A shell tears a hole in the side of the wireless room, and we hear, but do not see the explosion of the torpedo as it strikes. As the ship settles forward its final shot finds its mark in the submarine, and the latter bursts into flame. Throughout the whole scene the part of the ship that is visible rocks to and fro preserving perfectly the illusion of the long deep swell of the sea.

The mechanism which "rolls" the ship is really very simple. The whole set is built on trussed wooden supports, which act as huge rockers. Although the ship itself weighs several tons and there is the additional weight of eight or ten men, the whole is so nicely balanced that it is easily rocked by a few stage hands. The little submarine, which plays only a secondary rôle, is a much more complicated apparatus. In order to make the signal lights from the submarine appear distant they are in miniature, as are all the other regulation ships' lights which it carries. A part of the submarine is a red flame-shaped glass which is lighted up when the craft is struck.

The "sinking" of the vessel is shown in a scene which quickly follows. As the curtain is lowered the ship is pulled to the wings on heavy casters, and a long slot across the stage is opened.

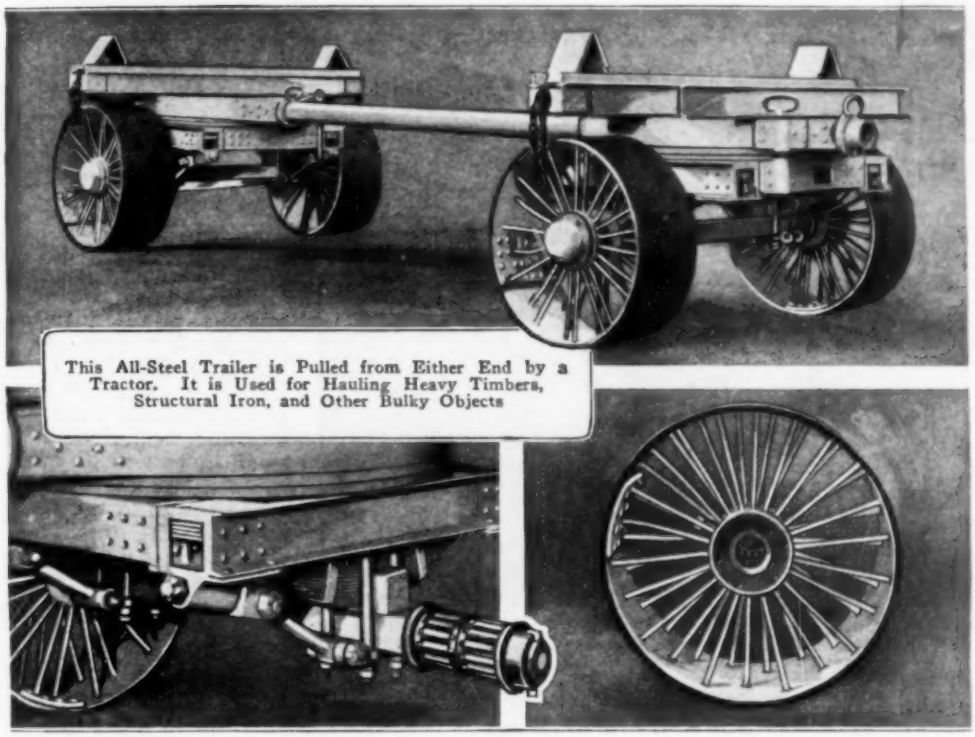
The movies are called to aid here in securing realism, for a section of film projected on a series of upright curtains at the front of the stage makes tossing waves that are little short of being wet. A huge piece of scenery representing the stern of the ship is dropped through the slot in the stage and thus "sinks." As this occurs, another warship comes upon the scene, appears to turn completely around on the stage and to move away.

Here again a most realistic illusion is secured by a simple mechanism. It would be impossible to build and operate a model large enough to show the ship turning. Instead three pieces of scenery are made to telescope behind one another. One represents the bow, one the side, and one the stern of the vessel. As the ship moves slowly onto the stage the pieces are arranged, left to right, as stern, side, bow. When it reaches the turning point the three pieces are telescoped until only the stern is visible. Then they are slowly drawn out again, but with the opposite arrangement.

The whole piece requires such a complex arrangement of "cues" and signals to the men who operate the various devices, several of which are at times in operation, that the stage manager has been provided with a switchboard from which he operates signal lights.

NEW AND UNUSUAL TRAILER OF 20-TON CAPACITY

An all-steel tractor-drawn trailer weighing 7,500 lb. and having special reversing features, is used in the West for hauling heavy logs, structural iron, and other bulky objects. It is pulled from either



This All-Steel Trailer is Pulled from Either End by a Tractor. It is Used for Hauling Heavy Timbers, Structural Iron, and Other Bulky Objects

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Each End of the Trailer is Equipped with a Full-Rotating Turntable, Mounted on Extra-Strong Semielliptic Springs. The Axles are Furnished with Heavy Roller Bearings. The Wheels Are 16 Inches Wide and Have 44 Spokes Each

end, an extra provision for use in inaccessible places. On both the front and rear axles, which are of 4-in. square steel, is mounted a heavy platform pivoting a full-rotating turntable on which are riveted the structural-steel cross members. The front and rear trucks are connected by a 6-in. steel pipe drilled with holes for wheelbase adjustment from 12 ft. to a maximum of 16 ft. The four semielliptic springs are of unusually heavy construction, each having 18 leaves, 5 in. wide and ⅜ in. thick. The wheels are 40 in. in diameter and 16 in. wide, with 44 spokes, ¾ in. in diameter.

SPRING THREAD CUTTER USES CARBON-STEEL TOOL

A spring thread cutter for lathes which incorporates the gooseneck principle for the elimination of chatter and in which no change from high-speed to carbon-steel cutter for smooth finish on threads is necessary, is now on the market. The tool is fastened in the holder at an angle of 15°, and its sides are correspondingly ground to cut a perfect 60° thread. Notched teeth are cut in the back of the tool and in the front of the dog, the unit being clamped together with the notched teeth enmeshed, by a bolt holding the dog to the tool holder, positively preventing slipping of the tool. Heavier

Roughing and Finishing are Both Practically Performed with This Tool on Account of Its Spring and Setscrew Adjustment

pitches are cut by adjustment of a setscrew against an auxiliary spring, located in the tool holder and which bears on the cutting unit. To sharpen, it is only necessary to grind the top surface of the tool until a new cutting point is established. The practice of roughing with a high-speed cutter and then changing to a carbon-steel tool for finishing is complicated and costly.

TORNADO FLATTENS TOWN, LEAVING VAULT INTACT

In a terrific tornado which struck the town of Braxton, Miss., recently, a vault in the town bank was the only construction that was not demolished. Part of the wall against which it was built also stood against the destructive gale. The bank cashier and his family took refuge within the vault and came through the storm unhurt. Ten persons are reported to have been killed and 24 seriously injured in the tornado, which lashed the town buildings into piles of kindling and brick.

What was Left of Braxton, Mississippi, After a Terrific Tornado Struck It: The Buildings of the Town were Reduced to Kindling, While Only the Bank Vault and Part of the Building Wall behind It Remained Intact

LIQUID AIR AND EXPLOSIVES USED TO EXPAND BOLTS

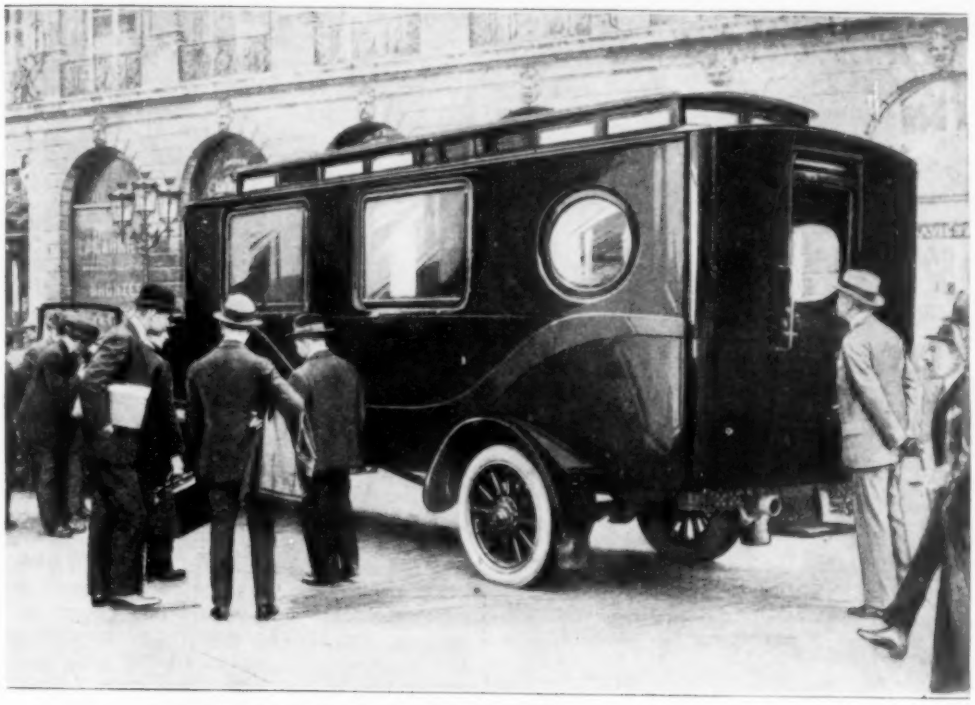
Two experiments comprising immersion in liquid air and an internal explosion are being tried by the Bureau of Standards to ascertain the value of these methods for keeping expansion bolts firmly in place. During the liquid-air process, the bolt is immersed until it has contracted sufficiently to permit its entry into the cavity provided. As it warms, it returns to its former size and consequently jams tightly in place. The average unit frictional resistance on cylindrical pins used in the tests was 2,150 lb. per square inch; with tapered bolts greater tightness was obtained. The second, or explosion, process consists in boring the axis of the bolt shank and exploding a charge within the bore. The tightness in this case will be proportionate to the size of the hole bored in the shank.

POISON AND HONEY COMPOUND TO LURE ANTS TO DEATH

Hordes of Argentine ants have become so aggressive in their advance upon the homes of Beaumont, Tex., that a campaign for their eradication has been launched. Two hundred pounds of genuine honey, 1,800 lb. of granulated sugar, and quantities of sodium arsenite and tartaric acid, will be mixed into an enticing but death-dealing sirup. Small tin cans, 25,000 in number and each containing a sponge, will hold the potion. Two small holes will be made in each can so that the ants can get to the sirup readily. The number of cans to be used will be sufficient to provide three for each home in the town, and they will be distributed by the Boy Scout organization. Various other civic organizations are also backing the city in its effort to stamp out the pest.

ELECTRIC LANTERN SHOWS RED OR WHITE LIGHT AS DESIRED

A new electric hand lantern, using two distinct dry batteries as a current source, is made with two bulbs which may be used one at a time, or simultaneously when a large volume of light is required, and a cylindrical red-glass sheath inside the main outer-glass protector. Normally the red sheath is held up in the lantern body so that the light is a clear white. A touch on a button causes it to drop down, and convert the lantern into a red danger signal. The advantage of the double bulb and battery arrangement is that the two divisions of the latter can be used alternately, permitting one to recuperate while the other is in service, and thus prolonging the life of both. Such an economy will be particularly beneficial to railroads.

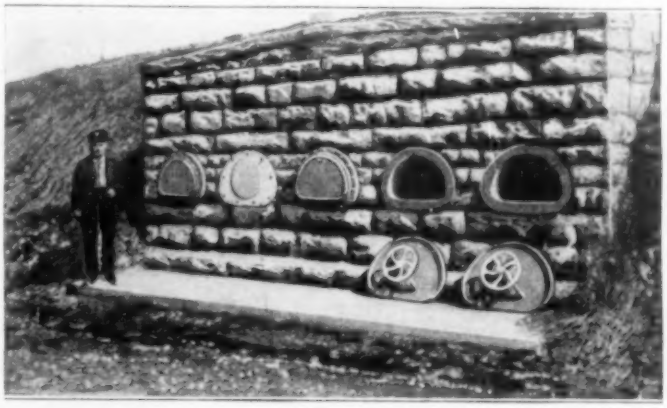


A KING'S MAGNIFICENT AUTO BECOMES A SIGHT-SEEING CAR

WHAT is conceded to be the most magnificent automobile equipment ever assembled, built especially to the order of King Albert of Belgium, is now in service as a sight-seeing car taking tourist parties over the great European battle fields. Designed to carry 15 passengers and furnish palatial sleeping quarters for 10 of the number, the elegant outfit is made in two units, one of which is a powerful touring car. The inclosed body, containing the berths, wardrobes, lavatory, and kitchen equipment, is mounted on a separate chassis and, hitched behind the motor car, becomes a trailer. It was originally intended to use the royal equipage as a big-game hunting car in the wilds of the Belgian Congo.

ODD FAMILY VAULT PREVENTS PREMATURE BURIAL

In Wildwood Cemetery, Williamsport, Pa., is located what is thought to be the only tomb of its kind in the world. It was built to the order of a citizen of that community 30 years ago to insure that none of his relatives should ever be buried alive. At the time of interment the body is removed from the casket and placed in one of the five vault compartments. These are lined with heavy felt to prevent injury, should the supposed dead recover and become panic-stricken. Ducts supply fresh air to all compartments so that one in a state of trance may not be suffocated. No person, other than the holders of the keys, can unlock and open the massive iron compartment covers from the outside, but they can be opened from the inside by handwheels.



Premature Burial Is Impossible When This Vault is Used. A Person could Live for Hours in One of the Compartments, or, at Any Rate, Long Enough to Open the Cover by Turning the Handwheel

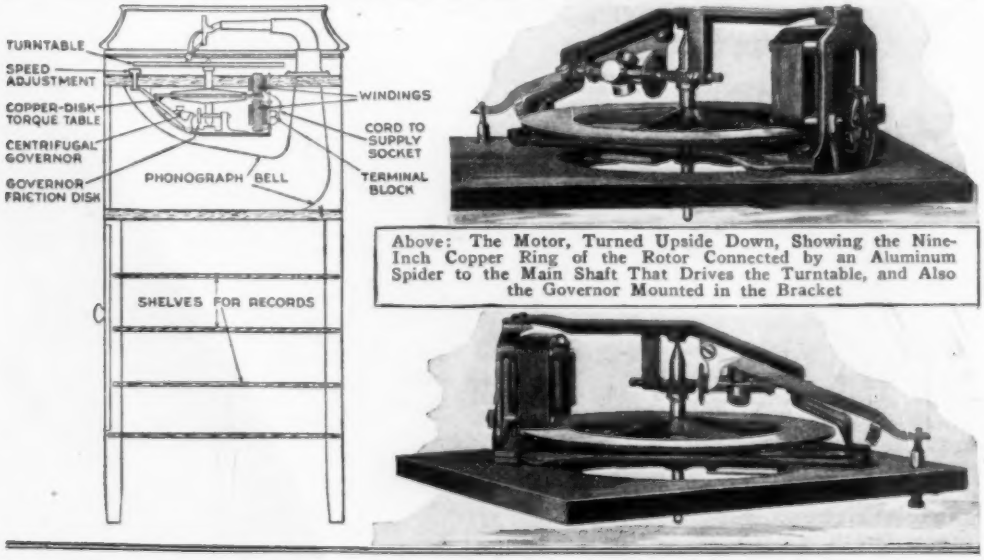
OVERHEAD GANGPLANK IS USED FOR VIEWING TRUCK LOADS

Often truck loads of material arriving at warehouses and docks take considerably more time in unloading than is necessary. This is due to the fact that the warehousemen do not know what composes the load. An overhead gangplank, outstretched far enough from the building for a good view of the truck load, is in use at one California warehouse. The plank is hinged at its lower end and may be drawn up to the side of the building by a pulley-and-rope arrangement. The gangplank is situated in a position convenient to the warehouse unloading door.

The Gangplank is Used at a California Warehouse for Ascertaining What Composes the Load to be Removed from a Truck at the Door Below

ELECTRIC PHONOGRAPH MOTOR THAT IS NOISELESS

It is desirable, if possible, to replace in the phonograph the old-fashioned spring motor with an electric motor, if for no other reason, because it needs no rewinding. The principal objection to the electric motor has been the noise that is inherent to all ordinary high-speed motors. An electric motor has now been constructed that overcomes this difficulty, on account of its comparatively low speed, and because of special features that eliminate vibration. The motor is a small induction motor, of which the rotor is a copper ring of 9-in. outside diameter and 1½ in. wide, connected by an aluminum spider to the main shaft. Thus, nothing in the machine has to run at higher speed than the phonograph record. This simple construction, with only two moving parts, and the small amount of power consumed in bearing friction, combine to make the motor very durable and dependable. It is also quite noiseless.



Above: The Motor, Turned Upside Down, Showing the Nine-Inch Copper Ring of the Rotor Connected by an Aluminum Spider to the Main Shaft That Drives the Turntable, and Also the Governor Mounted in the Bracket

Right: The Motor from Another Point of View, Showing More Plainly the Field Coils between Which the Rotor Passes. To the Left Is an Elevation, Partly in Section, of the Phonograph with the Motor in Position

An Old Hudson's Bay Company's Fortified Trading Post in the Heart of the Region Where Oil has been Struck: In the Foreground Are Barrels of Oil from the Adjacent Well at Fort Norman. Close to the Wall Is an Abandoned Old Yorke Boat, Once the Only Means of Transportation in Summertime

IMMENSE NEW OIL FIELD DISCOVERED IN SUBARCTIC REGION OF CANADA

By FRANCIS DICKIE

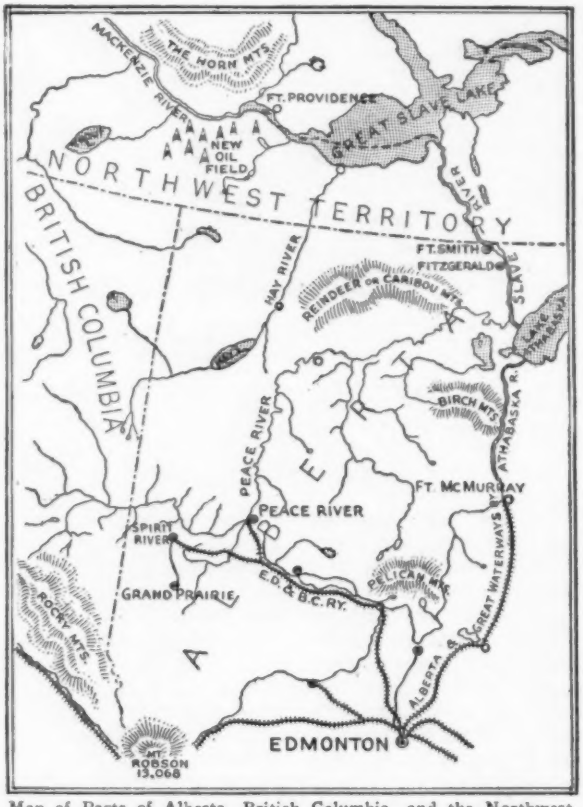
A NEW oil field of great wealth has been discovered in the subarctic region of northern Canada along the banks of the Mackenzie River and is now being developed. In August, 1920, the drillers brought in a well with a flow of about 1,000 bbl. daily. Since that time news of the new field has spread all over the world. But word of the strike did not reach the outside until October, when all the waterways were frozen, which prevented any large rush of men until spring. However, some few hardy spirits did dog-train in from Edmonton, and from Dawson.

That the field is one of great richness would seem evident from the fact that the company formed for its exploitation has had crews working in this remote and lonely region for several years. The government of the Dominion, too, was not unaware of the field, but only when the news of the first strike brought on the possibility of a rush to the district did the government act. On Jan. 24, 1921, they canceled all previous natural-gas and oil regulations relating to the Northwest Territories. On February 12, new regulations were made known, which reserve to the government three-quarters of all discoveries as crown reserves, a good deal more than the lion's share of the spoils. In brief, the regulations are to the effect that a man can get a permit to cover prospecting of not more than 2,560 acres; and two forms of title are provided, the first, a permit to prospect for oil and gas over this area for four years; and the second, in the event of discovery, a lease of one-quarter of the area at 50 cents an acre for the first year, and $1 for the second and third years.

Auto Fitted with Flanged Car Wheels to Travel on Alberta and Great Waterways Railway from Edmonton to Railhead, 220 Miles. The Road Is as Yet So Flimsy That the Car Much Outspeeds the Trains

But though the world at large is just coming to know of this new field, the richness of the Mackenzie River district

in oil-bearing ground is not at all a new discovery. Sir Alexander Mackenzie, in 1789-'93, during which years he traveled the great northland, noted the oil seepages and commented upon them in his writings. For a hundred years after, a few men were aware of the richness of this land in possibilities of becoming a producing field of world-wide importance. But no individual or small company had the capital to exploit a field so remote. Even big concerns left this subarctic region alone. Then with the demand for petroleum, and its by-products, principally gasoline, growing so large as to point to early exhaustion of the existing fields, the present company sent men to the new field, which, as mentioned above, in August brought in the first well. This well is on the Mackenzie River in latitude about 65°, and longitude 126° west. It is 1,600 miles from the nearest city, at Edmonton, and 1,400 miles from the railhead on the Alberta and Great Waterways Railway, near Fort McMurray, Alberta. But during four months of the year, June to September, a wonderful network of lakes and rivers permits easy access to the field.



Map of Parts of Alberta, British Columbia, and the Northwest Territories Showing the New Oil Field on the Banks of the Mackenzie River, in Latitude about 65 Degrees, 1,600 Miles North of the City of Edmonton, and 1,400 Miles from Railhead of the Alberta and Great Waterways Railway

The first 320 miles from Edmonton can be covered by rail, much of it new and unballasted track. On this a motor car fitted with flanged wheels is used, as this light car can travel much faster with safety than a train over skeleton track. From Fort McMurray, the river Athabaska, Lake Athabaska, and Slave River lead to Slave Lake and the Mackenzie, a water system interrupted by but one 16-mile portage, which is crossed today by modern caterpillar motors. The portage

Railhead of Alberta and Great Waterways Railway, near Old Fort McMurray Trading Post, Farthest Railpoint North on Way to New Oil Fields, and About 1,100 Miles from Where the Oil Company Made First Strike

exists between Fitzgerald and Fort Smith. From the latter point is a thousand miles of plain sailing. An alternate route is by the Peace River, which also merges with the Slave. Upon either route, flat-bottomed steamers and scows are operated. One type of boat used on this great inland waterway system is nearly flat of bottom, has very little draft—some boats 100 ft. long only drawing 3 ft.—and very wide of beam. One of these formerly operated on a river in the interior of British Columbia. Recently it was taken to pieces, and shipped knocked-down 2,000 miles by rail and water to be rebuilt on the banks of the Mackenzie. Several others, to be similarly rebuilt, are now being made in Vancouver for the Mackenzie River trade.

A peculiar stretch of banks on the Mackenzie River, famous in northern history for 200 years, is known as the "Ramparts." Between them the river narrows from nearly two miles' breadth to about a quarter the distance. The Indians call the stretch "the place where the river turns on its side." Many of the steamers operating on the Mackenzie River burn wood, and so, great quantities have to be gathered and piled upon the bank.

The Oil Company's Scow That Took the First Drilling and Prospecting Machinery to the New Oil Field: The Picture Shows the Scow on the Slave River at Fort Smith, with the Machinery on Board

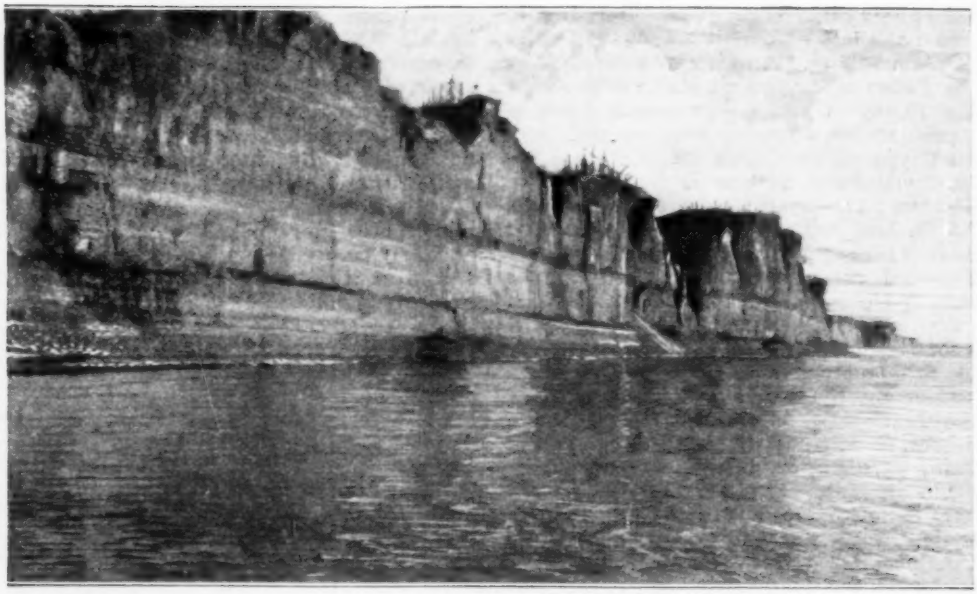
Light-Draft Steamer Typical of Craft Used on the Mackenzie and Peace Rivers: The One Shown was Taken Apart on a River in British Columbia, and was Shipped, Knocked-Down, 2,000 Miles to the Mackenzie River

The extent of the oil field is not at present known, but one government geologist places it at 500 miles long by 50 broad. Other authorities think oil may be discovered in paying quantities over a stretch of 300,000 square miles. As yet, however, most of it remains to be thoroughly prospected, for it is a region inhabited only by some tribes of Indians and scattered white men, few in number, at the fur-trading posts. A fortified trading post of the Hudson's Bay Company, probably the only fortified trading post still in use on the entire continent, stands in this region.

The petroleum is of very light grade, and one gas boat at least is using it in the crude state as fuel.

All river boats to the field have been booked a long way in advance. The season is so short that everything has to be done quickly, as it very seldom happens that the Great Slave Lake is open to navigation before July.

Perhaps the most interesting thing in connection with the new field is the part the aeroplane will play. The company sent two machines from New York to Edmonton in the dead of winter, a record cross-continent flight of which almost nothing has been said. These planes are all-steel monoplanes. The Dominion government is preparing to put on a seaplane service to carry mails, surveyors, and geologists, while two Canadian airmen with enviable war rec-



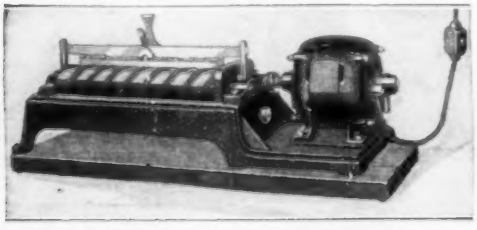
Aptly Called "Ramparts of the Mackenzie River," Two Such Rocky Walls, Two Miles Long, and Only About a Half Mile Apart, Constrict the River from a Breadth of Two Miles. The Indians Call It "The Place Where the River Turns on Its Side"

ords have ordered from England two specially designed seaplanes for passenger service. The rate of fare from Edmonton to the oil fields is quoted at one thousand dollars.

Thus the coming of the summer will see romance vanish. Aeroplanes in three hours' time will cover distances that formerly required months of arduous labor. The great lonely northland will be opened up by the thousands of oil seekers, and if oil is discovered in paying quantities, pipe lines will probably be laid down for great distances, or the valuable fluid be transported by fleets of tankers on the rivers of the north.

RAZOR-BLADE STROPPER HAS CAPACITY OF 200 PER HOUR

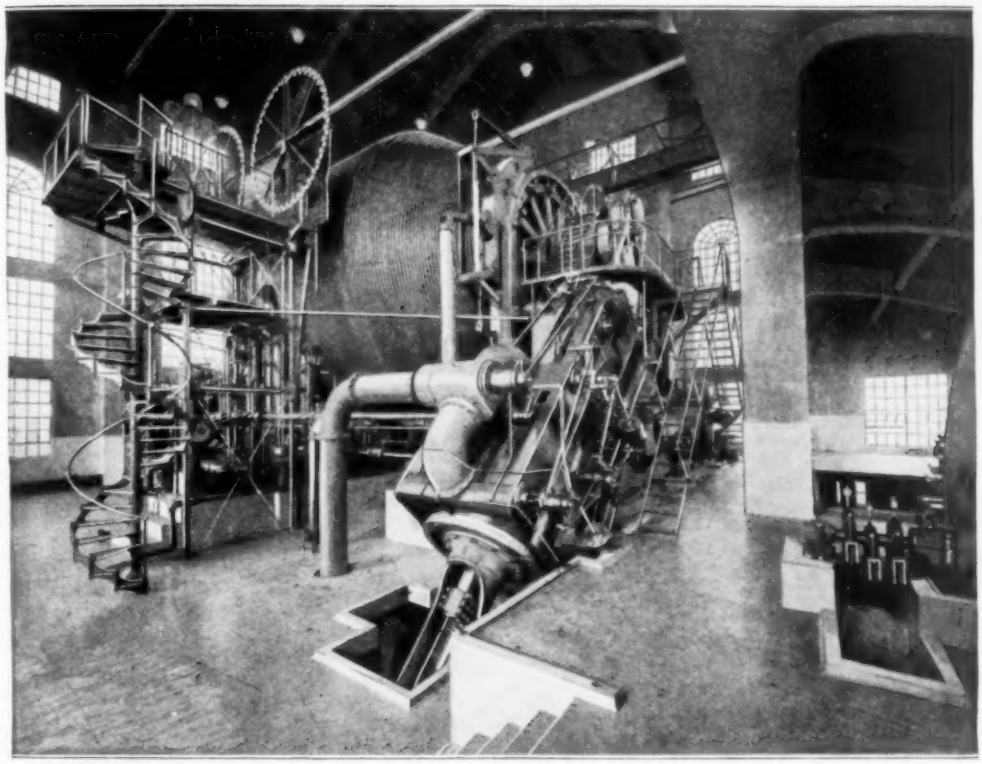
What is described as a safety-razor blade stropper, rather than a grinder, recently offered by an eastern manufacturer, is claimed to put a keen edge on 200 blades per hour. The stropping elements are two rollers, direct-connected to an electric motor, which, revolving in opposite directions at a rate of 1,200 to 1,500 r.p.m., strop both sides of the blade edges at the same time. Leather straps, attached to the rollers so as to form spirals, duplicate the peculiar heel-to-toe stroke used in stropping old-style razors. The clips which press the blades against the rollers hold six of average size.



A New Safety-Blade Stropping Machine in Which Spirally Arranged Straps Dress Both Sides of Six Blade Edges with a Sliding Stroke

BASALT IS NOW A COMPETITOR IN THE INSULATION FIELD

Basalt, a form of lava or molten rock, is now being experimented with as an insulating material in the place of porcelain or glass. The chief difficulty is that it loses its natural properties during solidification subsequent to melting for casting into the insulator form. Tests on a basalt rock which was not especially prepared and on a casting of it intended for a purpose other than electrical insulation, proved that its insulating quality was superior to other substances now in use. During the cooling process, a film envelops the basalt casting which does not break up nor crack as does a similar envelope on porcelain and glass. The basalt product is also desirable because of its resistance to varying temperatures.



A 3,000-Horsepower Mine Hoist Which Lifts 10 Tons at the Rate of About 30 Miles per Hour: The Powerful Automatic Brake as Well as the Conical End of the Huge Winding Drum are Here Shown. The Unseen End Is Also Cone-Shaped. At Its Greatest Diameter, the Drum Measures 30 Feet

MAMMOTH MINE HOIST LIFTS CAGES 30 MILES PER HOUR

Driven by a 3,000-hp. steam engine, what is believed to be the largest mine hoist in the world is in operation at Hancock, Michigan.

With its normal load of 10 tons in the cage, the big machine requires two minutes to attain a maximum cable speed of 3,200 ft. per minute. As about one-half minute is required to stop it, one trip of 10,000 ft. is made in about four minutes, or at a rate of about 30 miles per hour. The immense winding drum, made in the form of a double-ended cone, is 30 ft. in diameter over the flattened center section, and 16 ft. in diameter at the cone ends. This construction causes a gradual picking up and diminishing of the cage speed at the beginning and ending of a trip. The immense member weighs 516,000 lb. empty, this weight being increased to 557,500 lb. when the total length of 10,000 ft. of 1⅝-in. cable has been reeled in. The entire apparatus measures 60 ft. long by 54 ft. wide, towers 60 ft. to the top of the drum, and with condensing equipment, weighs 1,765,000 lb. Automatic throttle valves and brakes go into action as the cage nears the top or bottom of the 6,600-ft. inclined shaft of the mine. Thus is any chance of overwinding the cable eliminated.

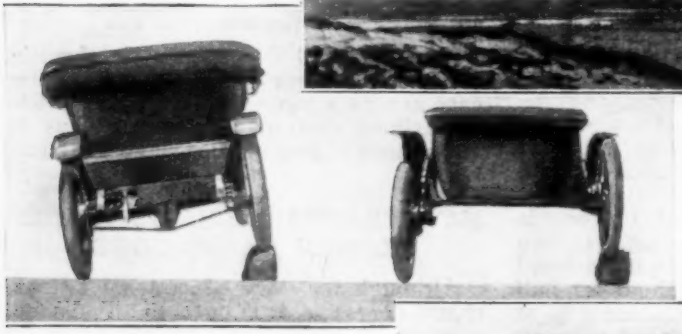
NAVY "EARN WHILE YOU LEARN" SLOGAN MAKES GOOD

Although the navy educational system is still very new, it is open to all enlisted men who wish to take advantage of it. Everything from the three R's to algebra and chemistry are included in it. From various high-grade correspondence courses throughout the country, the best material has been gathered and combined to offer the boys in blue as an education. Along with the study is a system of practical instruction to the student by the officers and petty officers of the ship to which he is assigned. Recently a hard-working machinist's mate received his certificate of attainment in the engineering course, thus becoming the first graduate of the navy's "Earn While You Learn" institution.

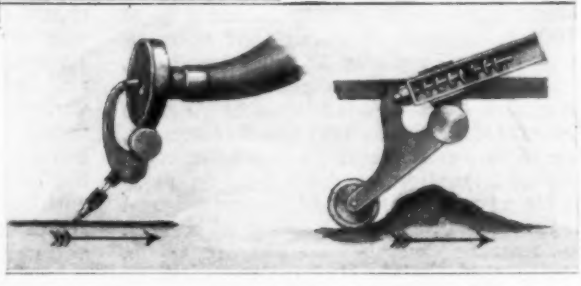
AUTOMOBILE DESIGNED TO JUMP OBSTACLES

The jumping stunts of automobiles in the movies are the result of trick photography. There has been produced in France a light car that does many of these spectacular performances, not only pictorially, but actually. It is a small, light car with a speed of 25 miles an hour, equipped with a light single-cylinder motor that is in the body of the car, close to the rear wheels, which it drives. The particular feature that enables the car to negotiate all obstacles with impunity is the manner of connecting the car to these rear wheels. It has been compared with the action of the human knee. A jumper bends his legs at the knees, and straightens them out rapidly to get the effect of a spring. The rear wheels do the same thing by means of a pivoted connection which allows them to rise independently of the car, and during this articulation a connection to the wheel expands a powerful coiled spring, which returns the force exerted to expand it in a manner similar to the action of a jumper's knee. On striking an obstacle the wheels rise independently of the rest of the car, which remains horizontal. Under test, when driven against an obsta-

Above, the Automobile is Shown Clearing an Obstacle by a 57-Inch High Jump, and on the Right It Is About to Land on All Four Wheels Simultaneously, at a Distance of 20 Feet from the Top of the Slope, by the Rapid Ascension of Which the Impulse is Given That Causes the Jump

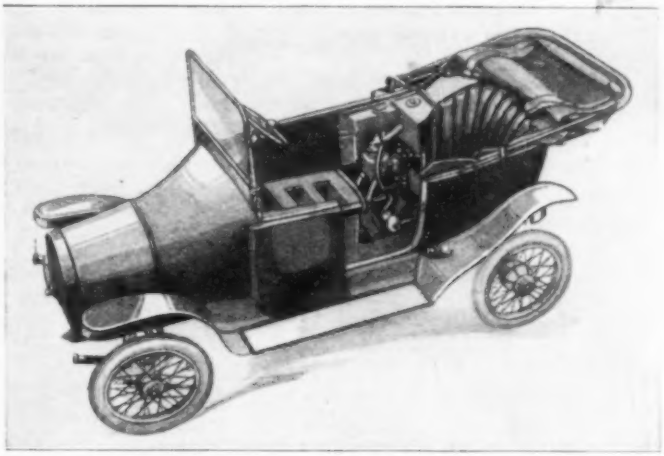


The Ordinary Auto to the Left Tilts When a Wheel Passes over an Obstruction. With the Articulating Wheel Connection on the Right, the Car Remains Horizontal, the Wheel Alone Rising over the Obstacle



Left: A Phonograph Needle Adjusting Itself to the Irregularities of the Record. Right: The Wheel of the Automobile Adjusting Itself Similarly over Road Obstructions

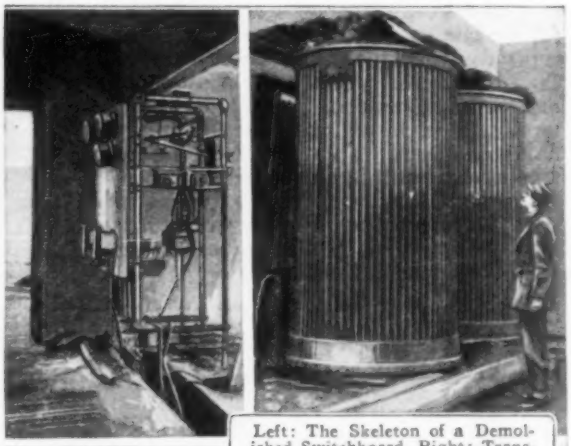
cle 40 in. high, with an approach sloping at 45°, the car was lifted to a height of 57 in., and landed at a distance of 20 ft., all four wheels striking the ground simultaneously. On landing, the spring in the wheel connection cushions the concussion of the wheel with the ground, again resembling the action of a jumper's knee, which bends under him as he alights. The French inventor is designing an equipment on the same principle to be applied to a four-cylinder touring car, and interest is rife as to whether it, too, will jump successfully.



A General View of the Car Showing the Location of the Single-Cylinder Motor in the Body of the Car Close to the Rear Wheels, Which It Drives by Means of a Chain; The Motor Is Very Compact, Weighing Only 125 Pounds, and Is Easily Accessible to the Driver. The Radiator Is in Front of the Car, Located as Usual

MAN-MADE THUNDERBOLTS RIVAL NATURE'S OWN

Few persons realize that the three-wire electric-power transmission lines spider-webbing some parts of the country are silently carrying along their slender threads of copper an artificially generated force that, misdirected, is more terribly destructive than the most powerful lightning flash. The latter spends itself instantly, while the former continues to flow and work havoc as long as the generator supplying it continues to run. The far-reaching damage that may result from the momentary failure of one of these lines carrying an electrical pressure of tens of thousands of volts was illustrated recently when the transformers in an Oregon substation became short-circuited. First came a stunning explosion, which blew the steel tops from the transformers and demolished the roof of the building housing them. Instantly their interior mechanism of steel and copper became a white-hot mass, setting ablaze the insulating oil with which they were filled. The resulting conflagration quickly reduced the expensive substation equipment to a tangle of wire and smoldering ruins, and deprived the community of electrical service for several days.



Left: The Skeleton of a Demolished Switchboard. Right: Transformers, Showing the Blasted Tops. Light-Shaded Upper Portions Show Depth to Which the Oil Burned

Exterior of the Wrecked Transformer Substation: The Corrugated-Steel Roof was Riven by the Intense Electrical Pressure and Warped by the Fierce Heat of the Burning Transformer Oil

FOLDABLE TYPEWRITER DESK IS HANDY OFFICE FIXTURE

A foldable typewriter desk, equipped with drawers for carbon paper and pockets for stationery and which takes up little floor space, is a handy fixture for the office. The desk is built with a high back section to which two hinged doors are fitted. Two leaves containing the drawers are hinged to the center, or typewriter, board, and are designed to hang downward when not in use. In closing the desk, the doors are folded into parallel position with the sides of the back section. The leaves are then released and dropped, after which a roller curtain that interlocks with the doors, is drawn over the entire unit. Typewriters with carriages up to 17¾ in. in width may be inclosed in the cabinet. The unit may easily be moved from place to place.

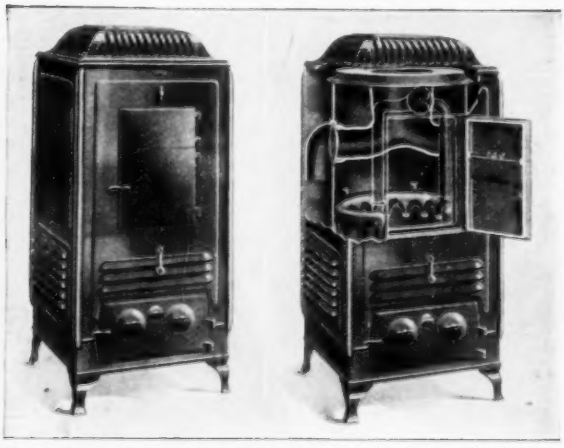
Left: The Typewriter Desk Folded. Right: Typewriter-Board Leaves Raised for Use

KETTLE HOLDER IS HANDY FOR CAMP USE

A new kettle holder is something useful for the camper. It consists of an upright central support which is driven in the ground and which holds a number of outward projections. These projections terminate in hooks, and kettles may be hung on them. To move the holder to a new location it is only necessary to pull the central support from the ground and slide the projecting members off. Little space is required by the holder, because of its compact construction.

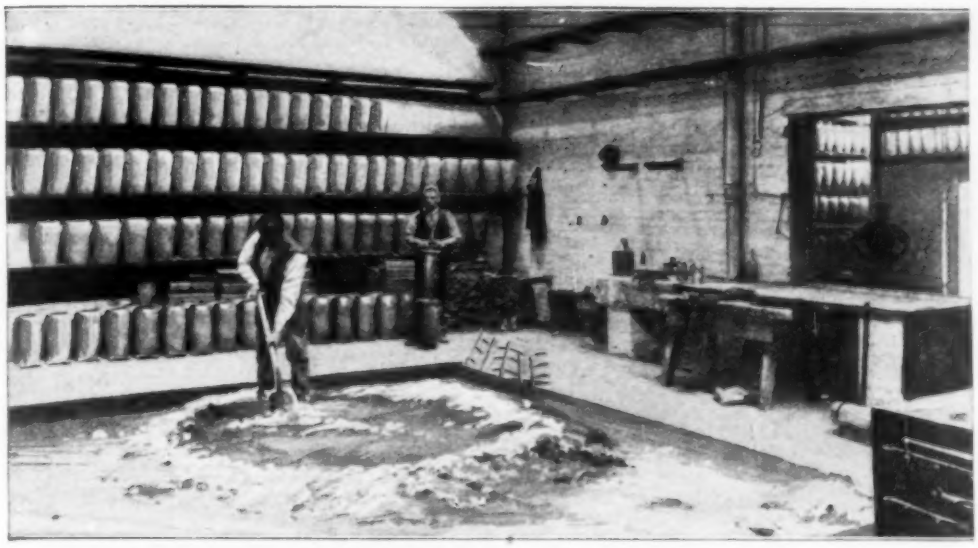
The Central Support of the Kettle Holder Carries Projections on Which Cooking Utensils may be Hung

NEW PARLOR STOVE RESEMBLES PHONOGRAPH



Left: The Phonographlike Heater as It Appears in Use. Right: Phantom View Showing the Internal Chamber and the Air Pipes

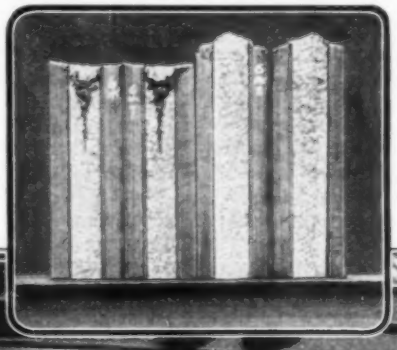
A decided departure from the ordinary line of stove design is represented by a new heater with which three rooms may be comfortably warmed and which burns hard or soft coal. It is modeled on the lines of a phonograph cabinet and is painted in similar colors. An internal drum of cast iron, inclosed within an outer casing of light metal, holds the fire. Air is admitted to pipes from the outside, through louver openings in the casing sides. These pipes cross the open fire where the air is heated and consequently floated outward into the air. The stove also contains a water pan to moisten its hot-air output.



A Corner of the Furnace Room, Showing One of the Fires with a Man About to Lift a Crucible: On the Shelves behind Him Are a Large Number of Crucibles Ready for Use

LARGEST CRUCIBLE FURNACE HAS FORTY-EIGHT FIRES

WHAT is declared to be the largest crucible steel furnace in the world is now in operation in one of the big steel plants of Sheffield, England. In a space of 18,000 sq. ft. there are 48 fires, consuming 28 tons of coke a day on natural draft. Each fire holds two clay crucibles, and four heats a day give a total output of more than 20 tons of the finest steel. The pots of molten metal, at about 2,700° F. and weighing 68 to 130 lb., are lifted manually with tongs from 3 ft. below the furnace-room floor to wheeled carriers that take them to the ingot molds, the entire 96 pots being handled in three minutes. A 5,000-ton press below the molds squeezes out all slag and blowholes, and an

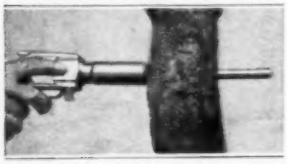


A View of Part of the Furnace Room: In the Inset Above is Shown the Difference between Ordinary and Fluid-Pressed Ingots. The Two Ingots on the Right, from the 5,000-Ton Press, Show Their Superiority over the Other Two Not Subjected to Pressure

overhead crane finally disposes of the ingots. The clay crucibles are used only twice, making it necessary to operate a pottery to supply the necessary 192 new pots a day.

TREES ARE SHOT TO DEATH WITH A SPECIAL PISTOL

A pistol has been devised in England specially for killing trees without felling them. They are actually shot to death, though the process of dying must be gradual. In place of a bullet, the pistol fires a solid-steel bolt through the tree trunk, in such a manner as to sever its life core, and thus leads to the early death of the tree. It is said that the device has been used quite successfully in England.



UNITED STATES' NEW ISLANDS ON "THE ROAD TO EVERYWHERE"

A pertinent question, very easy to answer, is, "What did we get for the $25,000,000 we paid to Denmark for the Virgin Islands?" Space permits only a summarized answer. The three principal islands acquired by the United States are St. Thomas, St. John, and St. Croix, and they form a connecting link between other possessions of ours, St. Thomas, the westernmost, being only 40 miles from Porto Rico, with the island of Culebra, belonging to Porto Rico, midway between them. St. Thomas harbor, on which is situated the principal town of the group, Charlotte Amalie, is the best developed and the best protected harbor in the West Indies. Coral Bay, on the island of St. John, though undeveloped, can be made into an even more commodious and better protected harbor. The Greater Antilles, comprising the larger islands of the West Indies, and the Lesser Antilles, comprising the smaller, together form a gigantic crooked arm inclosing the Caribbean Sea. The Virgin Islands are at the elbow, pointing straight at Europe, and past them streams the traffic between Europe and the Panama Canal, between New York and both the east and west coasts of South and Central America, and between the Antilles themselves; hence its characterization as "The Road to Everywhere."

RESILIENT WHEEL REPLACES PNEUMATIC TRUCK TIRES

Large lumber companies in the Northwest are experimenting with a new type of motor-truck wheel which, it is hoped, will prove a satisfactory substitute for pneumatic tires. It is of the disk type, the disk being recessed on both sides with eight chambers, into which are fitted heavy, round blocks of rubber. Two supplementary disks, also recessed to fit the blocks, are applied, one from each side, and drawn up tight. One of these carries the hub. A hard-rubber tire on the wheel rim completes the assembly. The hole in the wheel is so much larger than the hub that the two parts cannot touch, and all the weight is transferred from the hub to the wheel through the medium of the supplementary disks and the rubber blocks.

Resilient Wheels of Three Disks and Hard-Rubber Cushion Blocks are Used by Northern Lumber Companies to Displace Pneumatics. Right: The Wheel Assembly

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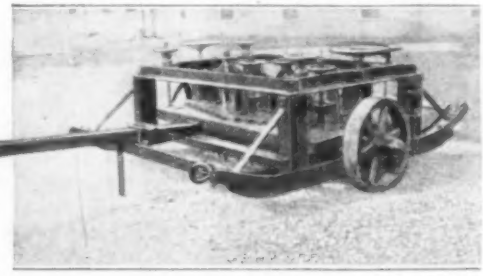
MYSTERIOUS EXPLOSION WRECKS FOUR-STORY CHICAGO BUILDING

A TERRIFIC explosion, occurring in a congested west-side district of Chicago recently, completely demolished the four-story building of its origin and shattered window glass in many others for blocks around. It is supposed that the basement of the blasted building contained a quantity of black powder for use in the manufacture of fireworks, and that this powder was set off by a box of Fourth-of-July torpedoes. An overturned motor truck, which was badly smashed in the wreck, yielded the body of its driver, on whose person a delivery ticket covering the truck's load was found. The ticket showed an item covering the box of torpedoes, and it is presumed that in delivering them he dropped the box, and its contents served as the detonating agent for the major explosion. Eight persons are known to have lost their lives. A defective gas main caused similar trouble, five years earlier, at a point close to the last wreck, but authorities have been unable to establish such difficulty in the latter case.

ROAD PLANER AND SCARIFIER MAKES ROUGH ROADS SMOOTH

A road planer, specially designed for use on bituminous roads, which are common in some parts of the eastern states, may also be used on macadam or dirt roads. It is a combination drag, planer, and scarifier. It is mounted on two steel runners of sufficient length to span the space between any road waves. These runners are equipped with an adjustable oscillating iron plate which holds the planer knives and scarifying chisels, or picks. Hand screws furnish the means of adjustment, to suit the conditions of the work to be done on the road. The machine is built to operate in either direction, and never has to be turned. It is constructed entirely of metal, and weighs 3½ tons. When at work, it is drawn by a tractor or steam roller. Removable wheels, and tractor pole, are provided for moving the machine from place to place. This can be done either with horses, or with a tractor, as may be desired.



The Road Planer with the Wheels and the Tractor Pole Attached for Transporting the Machine from One Job to Another: The Runners Are Adjustable, and the Whole Machine Weighs 3½ Tons

NEW LIGHTHOUSE DEVICES SAFEGUARD MARINERS

By JOHN W. KEAN

TWO new aids for the mariner have recently been developed by bureaus of Standards and Lighthouses of the Department of Commerce. The first is an automatic radio beacon, which is installed on lighthouses and light vessels to aid ships when fogs obscure or shut out the light from the sailors. After a number of experiments extending over several years, automatic radio senders for the transmission of the radio beacons were recently installed on the Sea Girt light station, the Ambrose Channel light vessel, and the Fire Island light vessel. When the installation was completed, the lighthouse tender "Tulip," equipped with a radio compass, made a thorough test of the practicability of the radio beacon as an aid to navigation.

The test was a complete success. The captain of the "Tulip," with no previous instruction in the use of the radio compass, was able to determine the direction from which the radio beacons, or signals, which were different for each station, were being sent. With his chart before him showing the location of the stations, he could easily plot his position at any time with the sole aid of the beacons. The use of radio as a beacon is a natural development of the radio compass. Like the compass, it is largely the work of Dr. F. A. Kolster, of the Bureau of Standards.

While the conservative engineer hesitates to make predictions, it is not unreasonable to assume that the next development of the radio compass will be an automatic device which will visually indicate the direction from which a radio signal is being sent, and which will, perhaps, even indicate the distance from the receiving to the sending station.

The second aid to the mariners produced by the Department of Commerce is an improved electric-lighting equipment for lighthouses.

A. W. Tupper, assistant engineer of the Lighthouse Service, is entitled to credit for this improvement.

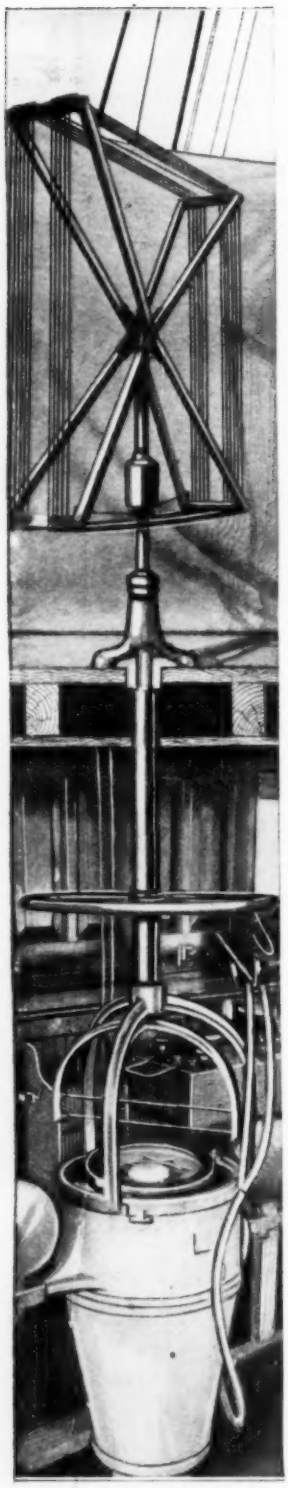
The new electric-light equipment has been under test for some time at the Ashland breakwater light station, Wisconsin. This test was also an entire success.

A small electric light would seem hardly suitable for a lighthouse. It is not the size of a light, however, but its brilliancy, that determines the candlepower of the beam of flashing light that pierces the darkness through the lens of a lighthouse. As the electric light is much more brilliant than the oil lamp, and as it requires a much smaller lens to throw a beam of equal candlepower, lighthouse engineers have been experimenting with the electric light for some time.

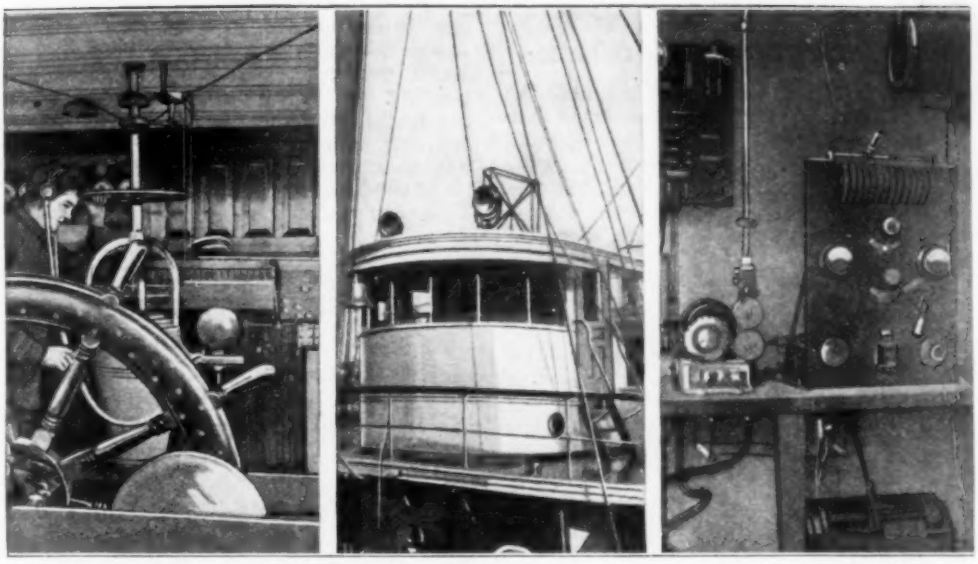
The difference in the size of lens required for the two systems of lighting is very great. A five-wick oil lamp requires a lens 72 in. in diameter, 10 ft. high, and weighing from two to three tons, to produce a flashing light of 193,000 cp. A 500-watt electric light requires a lens only 20 in. in diameter, 2½ ft. high, and weighing about 500 lb., to produce a flashing light of 250,000 candlepower.

Excellent lenses of the smaller sizes can be bought in the United States. It was necessary to get the big lenses in Europe.

The weakness of the electric light, however, was the fact



Radio Compass in the Pilot House of the Lighthouse Tender "Tulip," Showing Compass Coil on the Roof



Left: The Captain of the Lighthouse Tender "Tulip" is Seen Taking Bearings with a Radio Compass. Center: The Radio-Compass Coil on the Roof of the Pilot House of the "Tulip." Right: The Transmitting Apparatus for Radio-Direction Signals, as Installed on the Sea Girt Light Station, the Ambrose Channel, and the Fire Island Light Vessels

that it might burn out on short notice. The light in the lighthouse must burn steadily. This was the weakness Engineer Tupper set out to cure. Like many decided improvements of a mechanical nature, his idea was very simple to carry out.

Three electric lights, not much larger than an ordinary parlor electric light, are attached to a small shaft. In fact, the arrangement looks like a new-fangled parlor light. When in operation, the light rests on a small stand with the one lighted bulb extending directly above the shaft in position before the lens. Should this bulb burn out, electromagnets immediately snap the next bulb into place. This provides three bulbs, one lighted and two always in readiness.

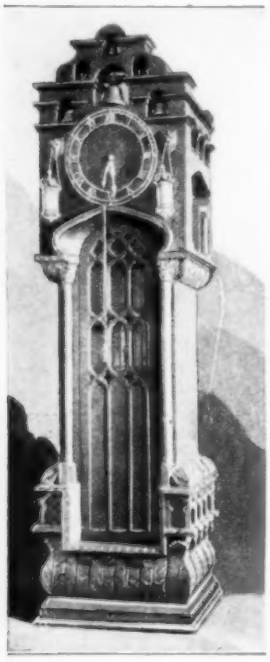
This light does not require a keeper. It is only necessary for an inspector to visit the light at intervals to change the bulbs and examine the simple equipment. In the Great Lakes region they are, or will be, connected to near-by electric-lighting systems whenever practicable. In addition, they will be protected by an automatic lighting plant in the lighthouse with a relay ready to cut in the local plant if the outside supply fails.

¶A new and unusual feature is on the athletic program of Oxford and Cambridge universities. The colleges will compete in an aeroplane race.

Ashland Breakwater Light Station, Where the Improved Electric-Light Equipment was Tested. Inset: The New Equipment, Showing How Small the Lights Are as Compared with Ordinary Lighthouse Apparatus

SAN GABRIEL MISSION TOWER REPRODUCED IN BIG CLOCK

The bell tower of the famous old San Gabriel mission, erected in California during the eighteenth century by Spanish monks, was taken as the pattern for a clock case recently carved from a solid oak timber. The massive timepiece stands 8 ft. high and is exquisitely achieved throughout. Each tiny arch in the upper part of the case has a bell in it, and the assembly forms the chimes for the clock. On either side of the face is a light made of wrought metal and representative in design of the incense burners used in the old mission. The front and sides below the miniature tower are even more elaborate, being also very highly ornamented by artistic carvings.

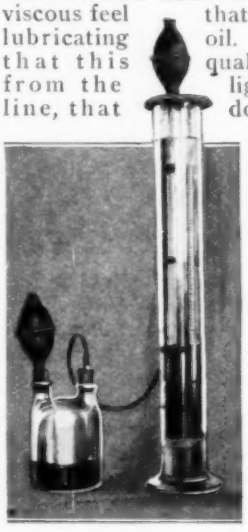


AUTO SPOTLIGHT IS MOVED FROM INSIDE OF CAR

An automobile spotlight-controlling mechanism, designed especially for installation on closed cars, although it may be used to advantage on the open models, is so constructed that the lamp body may be rocked back and forth or turned to right or left through the medium of a flexible shaft, ending in a U-shaped yoke, attached to the front of the lamp body, at its outer end, and a handle on the instrument board at the inner. To prevent the shaft from buckling, or kinking, it is inclosed in a section of rigid metal tubing which may be bent to any angle desired. The lamp is given the rocking motion by pulling or pushing on the handle and the turning movement by twisting that member to either right or left, both motions of the shaft being communicated to the lamp body through the U-shaped yoke.

FUEL-OIL VISCOSITY TESTED BY NEW INSTRUMENT

Anyone who buys oil for his car knows that what he wants is an oil that has the viscous feel that indicates a good lubricating oil. However, few know that this quality is not absent from the lighter oils, even gasoline, that do not feel oily at all. This property is not at all desirable for a good gasoline, and a recently patented instrument is used to test these light oils for their oily properties, or viscosity, as it is called.

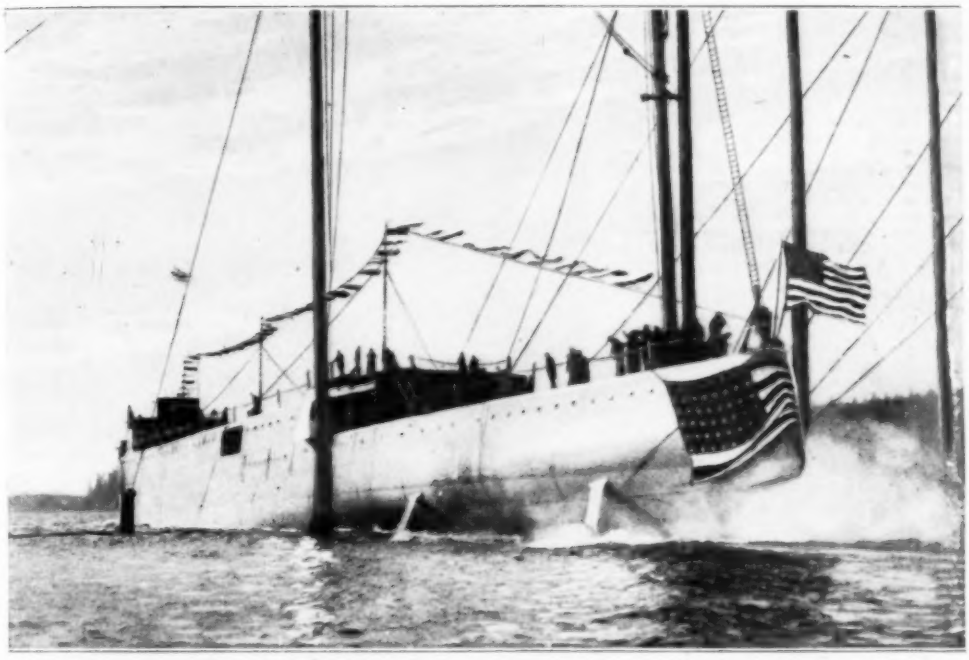


It consists of a glass tube and an accurate thermometer in a metal frame that is placed in the oil container. The glass tube has a very small hole through it, through which the oil rises. As this hole is extremely small, the oil rises very slowly.

In operation, the bulb at the end of the tube is squeezed, forcing out the oil. When the pressure is released, the oil rises again, and the time taken for it to rise to the top is noted, together with the temperature, as an indication of its quality.

The bulb on the smaller container is used to draw off any excess oil in the tester.

¶There are 13 known successful methods of removing tattoo decorations, all more or less painful and inconvenient. The chemicals used are salicylic acid, silver nitrate, carbolated vaseline, and tannin. The treatment should be administered by a surgeon as amateur efforts invariably achieve more or less serious results in such cases.



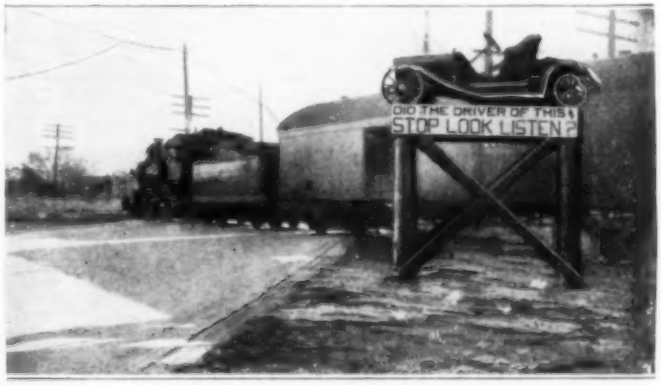
THE U. S. SCOUT CRUISER "MILWAUKEE" BEING LAUNCHED BOW FIRST

THERE are three ways of launching a ship: sideways, stern first, or bow first, of which the last is the least common. In launching the U. S. 7,100-ton scout cruiser "Milwaukee" by this method, at Tacoma, Wash., a precedent was established. The adoption of this method meant that, during construction, the stern of this ship was situated so that the heavy stern castings and shafting would not have to be carried so far to be installed. As the vessel is fitted with four propellers, the saving of time and labor was considerable. The "Milwaukee" is the second of three scout cruisers for which the government has awarded contracts at Tacoma. Ten vessels of this type have been authorized.

WRECKED AUTO EFFECTIVE RAILROAD-CROSSING SIGN

At the intersection of the San Antonio and Aransas Pass Railway with Roosevelt Avenue, San Antonio, Tex., is located the most effective crossing sign that has yet been devised. The attention-compelling feature is the wreckage of an automobile which figured in a fatal accident, at another crossing of the same road, in which two of the occupants were instantly killed and a third seriously injured.

With an earnest effort to reduce the number of such accidents, the claim adjuster of the road bought the wrecked car and had it mounted on an 8-ft. high platform at the Roosevelt Avenue crossing. Directly below it is the question, printed in large glaring letters, "Did the Driver of This Stop, Look, Listen?" A hand, following the word "This," points upward toward the wreck.



All Who Cross the Tracks at This Point Heed the Command of the Sign's Last Three Words. The Remains of the Auto, Wrecked in a Fatal Crossing Accident, Compels Attention

PEARLS OF LUSTER AND BEAUTY NOW MADE

France First Revived the Old Art of Making Artificial Pearls, and Was Long the Foremost Purveyor of These Gems to the United States and Other Countries. A French Chemist, Working in the United States, has Now Perfected a "Pearl" That is Said to Surpass That of His Mother Country. His Process Comprises, Briefly, the Manufacture of a Bead, and the Coating of That Bead with an Oil, Extracted by a Secret Process, from the Scales of the Common Herring. The Picture Shows a First Inspection of a Quantity of These Scales

A Pearl-Cane Glass Bead Is the Basis of the American Pearl, and It will Withstand Dipping in Hot Soapsuds. Gelatine, or Wax, Is the Basis of the French Gem, but It will Dissolve When Heated. The Girls Shown in the Center Picture are Spinning the Glass Beads to a Wire over Bunsen Burners. After Formation, the Beads and the Wire are Dipped in a Solution of Acid Which Dissolves the Wire and Leaves the Bead with a Hole for Stringing and Future Setting. In the Picture at the Left, the Workman is Clipping the Wires of the Beads Previous to Dipping in the Acid Solution. He Clips the Wires as Close to the Bead as Possible in Order to Save Time in Dissolving the Piece That Necessarily Remains

PHOTOS COPYRIGHT.

FROM THE SCALES OF THE COMMON HERRING

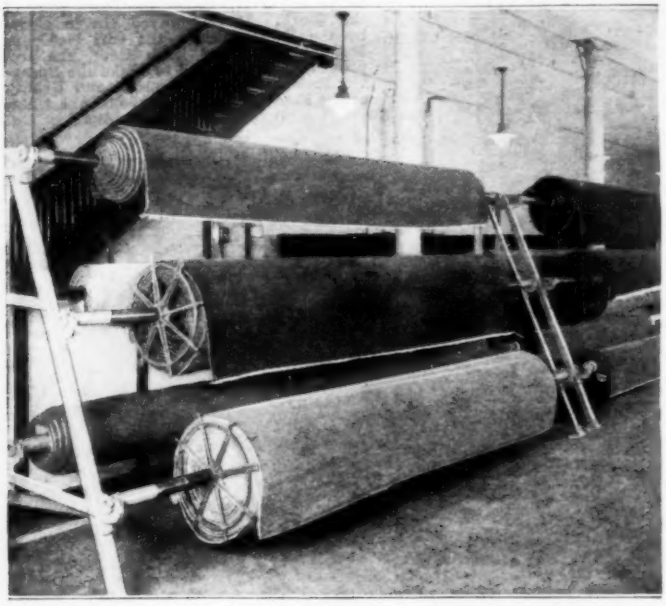
The Beads are Then Set on Pins So That They may be Conveniently Handled throughout the Rest of the Process. In Applying the Oil Great Care must be Exercised, For This Is the Pearl Part of the Work. It is Sprayed On in Coats by the Device Which the Girl Holds in Her Hand. After Each Coat, the Improved Pearl is Baked to Make the Spraying Hold. The Size, Luster, and Beauty of the Finished Gem Depends on the Number of Such Sprayings

Burnishing Follows Each Coat Baking, and Caution Is Again the Keynote of the Operation, For If the Human Hand Touches the Pearl, the Luster is Destroyed and the Process must be Repeated. The Burnishing Consists in Rubbing the Pearl on a Piece of Chamois Powdered with French Chalk. Between 15 and 40 Such Treatments are Given Each Jewel, After Which It is Released from the Wire Setting, and may Now be Touched without Risk of Injuring the Finish

Girls Engaged in Stringing the Finished Jewels: Each Gem Is Given a Rigid Inspection Before It Is Ready for Packing and Shipping. There Are About 600 People Employed in the Pearl Industry in a Town on Cape Cod. Any Tint may be Obtained by the Process, Including the Much-Desired Creams and Pinks Watched for by the Connoisseur of the Expensive Natural Product

HEAVY RUGS EXHIBITED ON CONVENIENT RACK

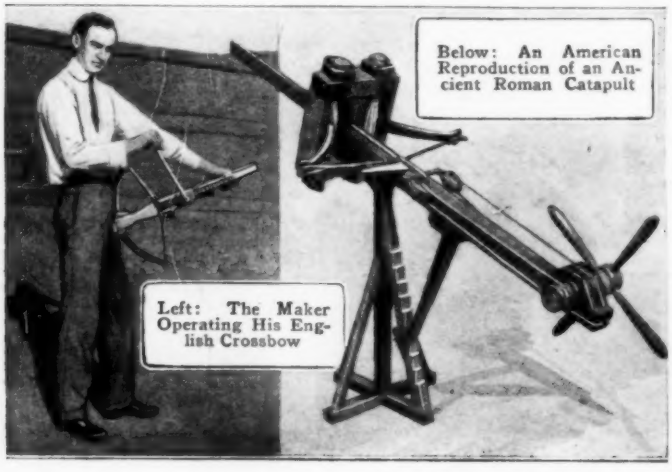
Because of their bulkiness and weight, large rugs are generally shown to the buying public in small samples, and by observation of these samples, the prospective purchaser gets his only, and a very meager, impression of the complete rug. To do away with this difficulty and to facilitate the exhibition of the heavier-grade rugs, one Chicago company has developed a convenient rack. This rack consists of a framework in which are several iron spools upon which the rugs are wound. These spools are ratcheted at their ends to prevent the heavy rolls from becoming unmanageable in rewinding. When a customer desires to see more of a certain rug, the salesman simply unwinds it far enough to make it lie on the floor. By placing a chair or some other piece of furniture on the outstretched rug, a good impression of its appearance may be gained. The rolls, which vary from 9 to 18 ft. in width, are rewound by handles or handwheels.



Heavy Rugs are Exhibited by Pulling a Sufficient Length onto the Floor from the Rack. They are Rewound by Handwheels Attached to the Ends of the Spools

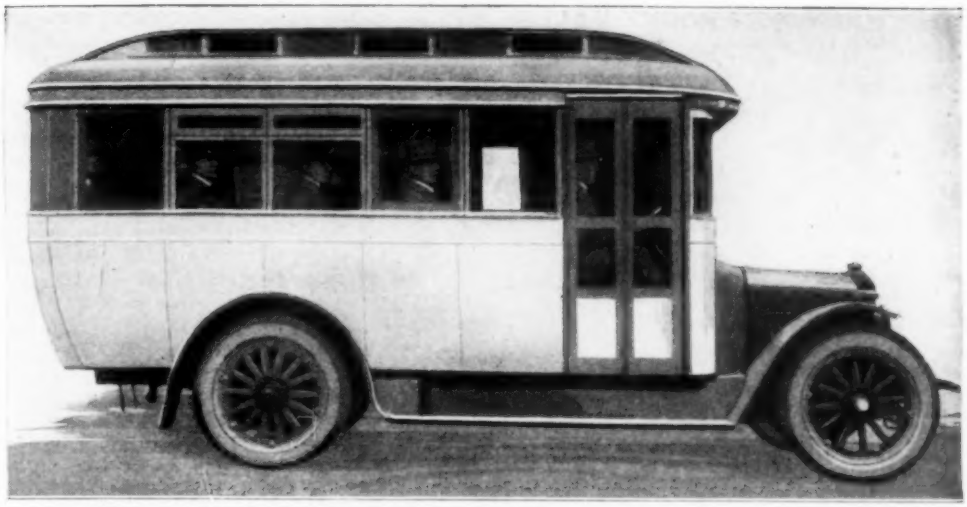
ANCIENT ROMAN CATAPULT AND ENGLISH CROSSBOW

In ancient times, the counterpart of the modern "Busy Bertha," or high-explosive shell, was the catapult. Conquering Cæsar depended entirely upon this weapon in the subjection of fortified cities. Probably the only existing specimen in the United States is the result of several years' work by C. H. Ross, of Lakewood, Ohio. From the study of ancient Roman histories, and military documents, he was enabled to reproduce a very effective weapon, made in the same manner and of the same materials, but of only about half the size of the smaller Roman catapults. It is 30 in. high, 19 in. across the bows, and has an arrow trough 4 ft. long. It hurls an iron arrow through a 1-in. plank at a range of 100 ft. The crossbow, the weapon upon which the English of the Middle Ages depended so much for their conquests, particularly in France, on such occasions as the battles of Crécy and Poitiers, has also been reproduced.



Below: An American Reproduction of an Ancient Roman Catapult

Left: The Maker Operating His English Crossbow



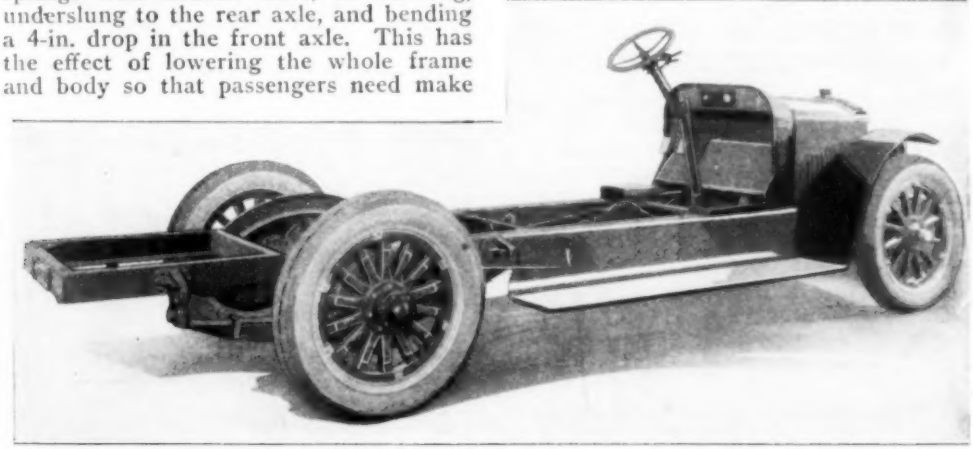
Seating 15 Passengers, the Grown-Up "Jitney" Busses in Kansas City, Missouri, are Providing a Public Transportation Service Which is Meeting with Overwhelming Popular Approval. To Such Proportions has the Industry Grown, That 200 Coaches like the One Pictured Above are being Rushed Into Service

SPECIALLY DESIGNED BUSSES ARE DIGNIFIED "JITNEYS"

The "jitney" business in Kansas City, Mo., has grown to such proportions that it has attained the dignity of a public utility, and has long passed the point where light five-passenger cars were capable of caring for the patronage. Accordingly, one of the "jitney" associations is building 200 comfortable coaches, seating 15 passengers each, which are being rushed into service as rapidly as they can be completed. Standard 1-ton truck chassis are remodeled by lengthening the frame 10 in., replacing the standard 50-in. rear springs with heavier ones, 60 in. long, underslung to the rear axle, and bending a 4-in. drop in the front axle. This has the effect of lowering the whole frame and body so that passengers need make but one step from the curb when entering. The machines will run on regular schedules and routes, which latter will be plainly marked by signs on the cars.

JELLYFISH FILMED TO SHOW MUSCULAR REACTIONS

The motion-picture camera is being used to photograph the muscular reactions of various forms of animal life while under the influence of acid and electrical treatment. A jellyfish, one of the simplest forms of animal life, was recently filmed in this manner by the biology department of an eastern university.



Stock Models of a Ponular Make of Motor-Truck Chassis Form the Mechanical Units of the Big New "Jitneys." These have been Remodeled by Lengthening the Frames, Replacing the Original Rear Springs with Heavier Ones and Bending a Four-Inch Drop in the Front Axles

TRACTOR MAKES ROCKY VALLEY INTO USEFUL LAND

Several thousand acres of good farm land, located in the San Bernardino Valley of southern California, will soon be available for cultivation because of the removal of a surface layer of bowlders with a farm tractor. Ordinarily it would take a team of horses a week to clear the area which the tractor clears in one day, and the cost is very moderate in consideration of the producing value of the land. Heavy log chains are placed about the huge bowlders, and the tractor pulls them out with ease, piling them where they can be later removed for building purposes.

Several Thousand Rock-Covered Acres in the San Bernardino Valley, California, will Soon Be Fit for Cultivation through the Use of Farm Tractors. These Machines are Clearing Large Acreages Daily

THE PINE-BARK BEETLE PEST DESTROYED BY ELECTRICITY

Of the natural resources of Oregon none is more important than its pine forests. The natural enemy of the pine is the pine-bark beetle, and therefore the Oregon Agricultural College is making elaborate experiments with the object of finding some effective method of destroying these pests. The medium is to be electricity, for it has been found that a current of 110 volts kills the beetle in all stages of its development. A ring of the bark is stripped from a beetle-infested tree, and on top of the sappy surface thus exposed, there is secured around the tree a chain with wires connected to it so as to convey the current through it. In some cases a single chain is used, but in large trees more are needed.

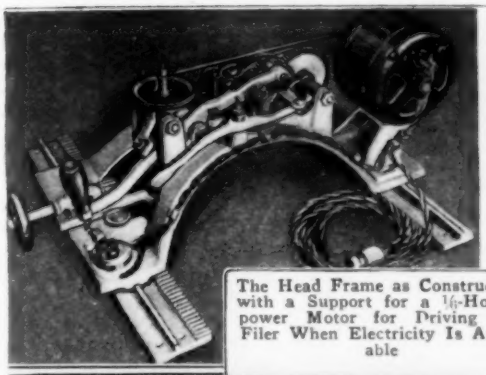
FRENCH HYDROELECTRIC PLANT HAS COMPLEX WATER SYSTEM

Located in the Pyrenees Mountains, and utilizing the water of many small and irregular streams, a 35,000-hp. hydroelectric plant now operating at Eget, France, is notable for its complex hydraulic system. Large dams transform a number of lakes into reservoirs, some with as much as 250,000,000 cu.-ft. capacity, giving a constant supply of 390 to 460 ft. of water a second. A tunnel 10,168 ft. long, of 106-ft. per second capacity, including a 128-ft. aqueduct across a chasm, connects two of the reservoirs, and another tunnel, 18,368 ft. long, through solid rock, carries the entire water supply to an underground reservoir above the plant. Seven 5,000-hp. turbines, direct-connected to 3,500-kw. generators balanced by 7,700-lb. flywheels, work with a head of 243 ft. Ultimately a voltage of 120,000 will be used for transmission.

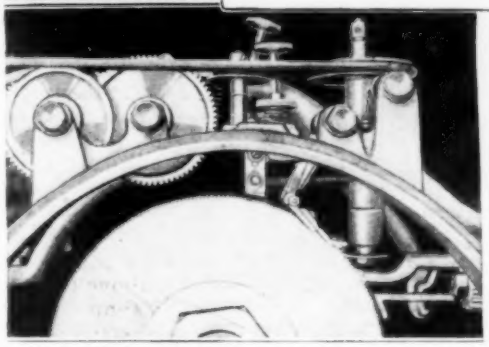
GREASE BUCKET AND PUMP HANDY IN PRIVATE GARAGE

The unpleasant task of replenishing the grease in automobile transmissions and axles is robbed of some of its disagreeable features by a new combination grease bucket and pump, which is claimed to handle all grades of lubricants easily and cleanly. Besides injecting the grease directly into the parts, the device can be used to fill small grease guns quickly,

Handy Garage Grease Bucket and Pump: Left, Bucket with Small Grease Gun on the Side. Center: Filling Small Gun. Right: Working Grease to Soften It



The Head Frame as Constructed with a Support for a ⅛-Horsepower Motor for Driving the Filer When Electricity Is Available

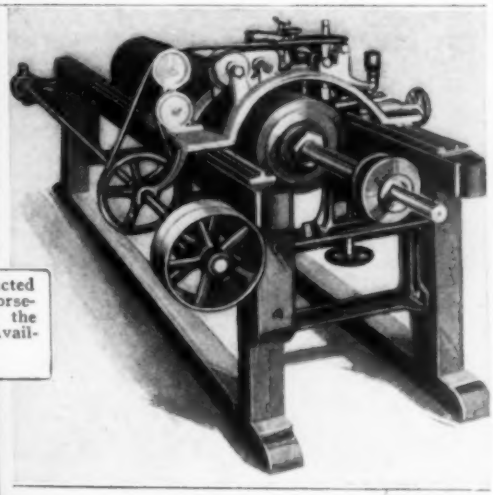


A Close-Up of the Head Frame, Showing the Working Parts with the Rotary Filer and Its Adjustable Stop in Operation on a Saw

without the necessity of soiling the hands, by simply inserting the nozzle of the gun into that of the pump-outlet tube and working the pump plunger. It is this feature which will prove of interest to motorists who store their cars in private garages.

NEW ROTARY GIN-SAW FILER OPERATES AUTOMATICALLY

Of interest to cotton ginners will be a new rotary gin-saw filer that has been introduced in Texas. The machine files evenly, rapidly, and automatically the teeth of gin saws. With it, it is said, a 70-saw cylinder can be sharpened in 3½ hours. It will file any size saw to any pitch, and keep the teeth uniform. The saw is held stationary in the center of the frame of the machine while the file is in action. A rigid guide prevents the saw from vibrating. On this frame is placed a substantial cast-iron machined rack for moving the filer from one saw to another. All the working parts are supported in a head frame, made in one piece, and milled to fit the track. There is an adjustable stop to prevent filing too deep. Where electricity is available, the



A General View of the Machine, with a Saw in Place, When Constructed with a Countershaft and the Necessary Pulleys for Belt Drive

machine is driven by a ⅛-hp. motor. For use elsewhere it is equipped with a countershaft carrying tight and loose pulleys for driving from any available power, such, for instance, as a 1-hp. gasoline engine.

CONNING TOWER ON ROOF IS PLEASANT RETREAT

A towerlike bungalow which its builders have named the "Conning Tower," is built on the roof of a Sawtelle, Calif., office building. It is constructed chiefly of casings and glass windows, and this provides much air and light. The inside equipment consists of chairs, sofas, and other restful furniture. Magazines, books, and an interesting view of the surrounding country divert those who frequent this comfortable retreat.

The Roof Conning Tower is Well Furnished and Makes a Pleasant Noonday Retreat

CROSSBREEDING TREES TO STRENGTHEN SPECIES

By HARRY A. MOUNT

BY careful breeding and the crossing of strains, civilized man has been able to improve many of the animals, the fruits, and the vegetables that he finds useful, and has even developed some distinctly new species. Why not apply the principle to our forest trees as a solution of the tremendously important problem of rehabilitating this greatly wasted national resource?

Desolation Left in the Wake of a Forest Fire: Were This Area Immediately Replanted with Spruce Saplings, 50 Years or More would be Required for Them to Attain a Size Suitable for Paper Making

Breeding new types of forest trees that would not only grow faster, but produce a more useful wood was first the idea of an Irish university professor. He has been hampered in his work, however, by the events of recent years, and the work has been undertaken in this country by Dr. Paul McKee, a professor at Columbia University. It has already been carried far enough to indicate great possibilities.

Doctor McKee first became interested in the breeding of trees through interest in the paper industry, which now faces a crisis because of the wasteful use of spruce, the best of all paper-making woods. It requires more than a half century for a spruce tree to reach a size suitable for commercial purposes. Doctor McKee believes a hybrid spruce can be produced which will attain the same size in 10 years and which will be even better adapted for paper making.

"Every man who has raised chickens knows the disastrous results of inbreeding," Professor McKee says. "Our laws recognize the same principle in preventing the marriage of near relatives. It has been shown that inbreeding in plants has precisely the same effects. It dwarfs the species, weakens the strain, and reduces the size and quality of the fruit.

"On the other hand, careful selection and crossing will produce just the opposite results. This fact is well established and has been taken advantage of by modern science.

"When our tree experts attempt to reforest a devastated area they plant strains of trees which have been inbred for many centuries. It is largely for this reason that the task of reforesting the great areas which have been devastated by wasteful cutting and fire seems to the average man well-nigh hopeless."

It is Thought That Crossbreeding will Reforest Areas Such as This Section of the Colorado National Forest, Burned Over in 1890

No immediate results from these experiments can be expected, however. It is estimated that it will take at least 10

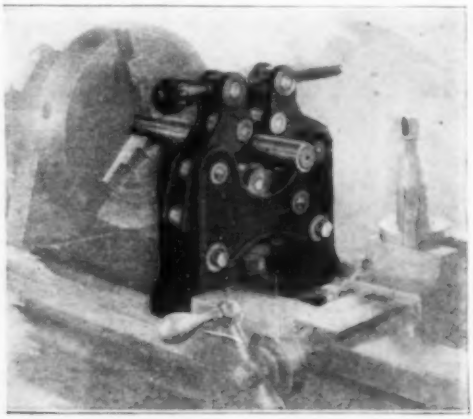
years, perhaps longer, to develop suitable new strains, and these must be grown in great numbers before any considerable area can be planted. In 25 years some results may be expected on a large scale, but it will probably remain for future generations to profit largely from the idea. Some of us may live to see the day when our shade trees will grow to good size in a couple of years, when farmers will find wood growing profitable, and when our great national forests are no longer threatened with extinction while they furnish timber to meet all the nation's needs.

TELEGRAPH-POLE CROSSARMS MAY BE RAISED OR LOWERED

Raising and lowering of the upper cross members of a telegraph pole is now successfully performed. They may be adjusted to any level desired within the limits of the metal supports which hold them in place. These supports consist of three angles bent to the proper degree and are fitted to the crossarms. They are adjustably attached to the pole at the bottom, and the change in height is accomplished by releasing the fastenings at their lower extremities and moving them up or down as the case may require.

NEW STEADY REST FOR LATHES IS SELF-CENTERING

A greatly improved steady rest, to be used on lathes when turning long pieces of shafting, recently offered on the market by a large eastern machinery manufacturer, will prove of interest to machinists generally. The contact pieces, instead of being plain, as in the conventional type of rests, are three in number, made of hardened-steel rollers running on roller bearings. These need not be adjusted separately, as they are brought into contact with the work simultaneously, by two simple movements of the clamping lever. This feature makes the device perfectly self-centering for all

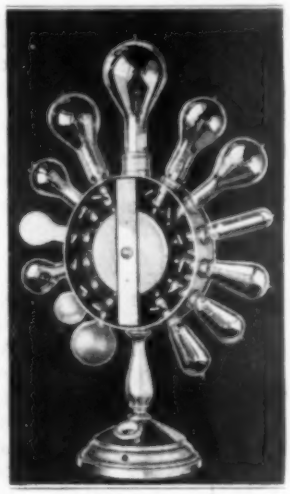


In a New Lathe Steady Rest the Contact Parts Are Rollers. All Sizes of Stock can be Turned without Changing the Original Adjustment

sizes of stock within its capacity, without the necessity of altering any adjustments once it has been accurately set to the height of the lathe-chuck center. The work is put in and taken out at the top, the clamp unscrewing and lifting up to permit this to be done rapidly.

LIGHT BULBS DISPLAYED ON HANDY RACK

A rack equipped with a number of sockets for the attachment of electric-light bulbs is a handy device for displaying these articles. Each socket is wired with a separate switch so that anyone wishing information in regard to a certain lamp, may see it lighted. Lights varying from 25 to 300 watts are exhibited in the rack. There is an additional socket in the base of the stand which is provided for testing the lamps before the purchaser takes them away.



CROSSCUT SAW OPERATED BY ONE MAN SEATED

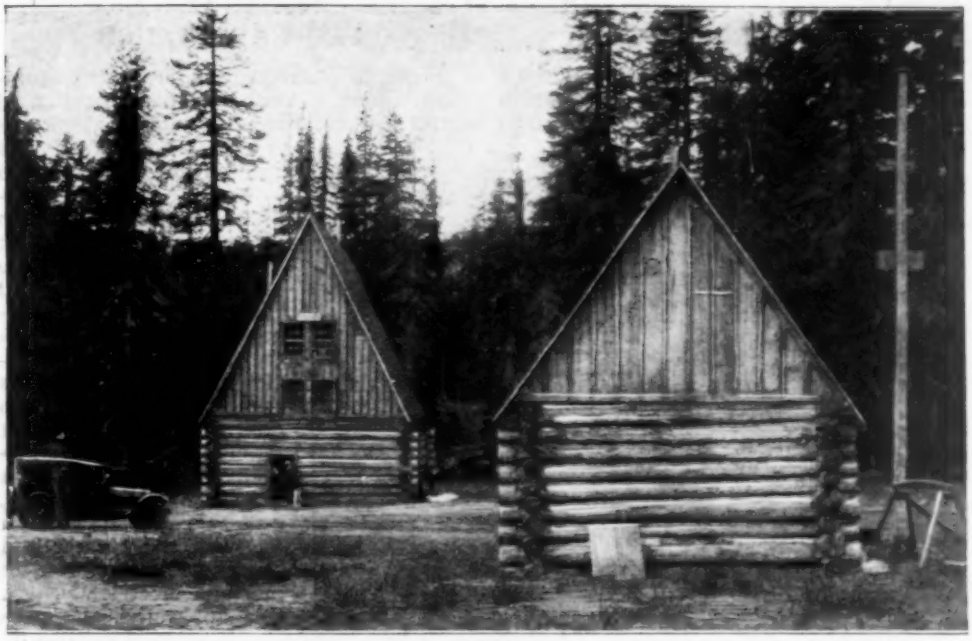
In the ordinary way, it takes two men to operate a crosscut saw, and they have to work standing. A machine has been constructed with which a crosscut saw is operated by one man, and he does his work seated. The seat is carried in a substantial wooden frame that is supported about 5 ft. above the ground by two uprights, spaced apart at a distance somewhat greater than the length of the saw. Mounted in each of these supports, below the seat, is a light pulley around which passes a cable, from each end of the saw, that leads to an oscillating treadle located near the operator's seat, who by this means causes the saw to swing backward and forward. The saw is guided by two sets of verticals, which are controlled by the operator, by means of levers adjusted by hand.

The Operator, Seated, is Swinging the Saw with His Feet While with His Hands He Adjusts the Guides That Control the Saw

EFFECTIVE DEVICE COMBATS DANGEROUS DOCK FIRES

A ship lying alongside a dock is frequently in danger from what is known as "under the dock" fire. As the name implies, such fires occur underneath the solid concrete slab which forms the working deck of the dock. To avoid the delay caused by the necessity of cutting through the concrete slab, Chief A. W. Myers, formerly of the New York Fire Department, has constructed a device which can be attached to any dock or structure in such a position that the fire can be reached directly. It is in the form of a narrow platform large enough to accommodate six men, and having an upright well-braced arm at either end, carrying an adjustable swivel hook, by means of which the platform can be suspended and raised or lowered as desired. The device has been in use at Brooklyn, and has won much favorable comment from the officials on the water-front. It will be used at other docks.

The Men Have the Fire-Fighting Device Ready to Hang by the Adjustable Hooks, Shown above Their Heads



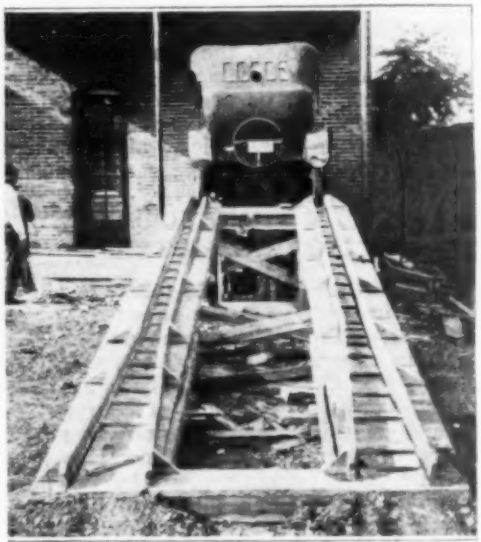
Crater Lake Park Snows Are So Deep and Heavy That the Superintendent of the Park was Obliged to Build These Cabin Headquarters with Very Steep-Pitched Roofs. The Boards on the Pole Mark the Depths of Various Snowfalls

CURIOUS LOG CABINS HOUSE CRATER LAKE PARK OFFICIAL

Numerous deep snows that would crush a roof of ordinary construction have led the superintendent of Crater Lake National Park to build his headquarter cabins with high-pitched roofs. The steep incline produced is of great assistance in keeping the roofs clear of the heavy drifts. A pole in the yard surrounding the buildings has boards nailed to it which indicate the depth of the snows occurring there. It is evidence that the buildings are often nearly buried.

INCLINED RUNWAY SPEEDS AUTO-GREASING SERVICE

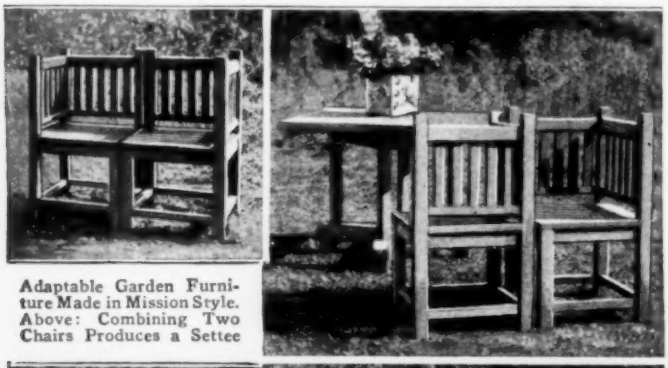
An up-to-date automobile laundry in Little Rock, Ark., also specializes on lubrication service. Part of the work is the filling of grease cups, difficult of access under the car, on the steering linkage, etc., the spreading of the spring leaves, and their treatment with lubricant. To speed up the work, the cars are driven to the top of an inclined runway, outside the building, which is high enough at the top to permit a workman to stand upright while performing the various operations. The outdoor runway has been found vastly superior to the old-style pit-in-the-floor system, as no artificial illumination is needed; the workmen enjoy the fresh air, their movements are not restricted, and they lose no time climbing into and out of a pit, or worming their way underneath cars.



An Open-Air Inclined Runway Especially Designed to Facilitate the Greasing of Automobiles: The Workman is Not Forced to Stoop but can Stand Fully Erect at His Work

COMBINATION FURNITURE FOR GARDEN USE

Beauty as well as service is combined in the construction of the late-edition garden furniture. The chairs are made in mission style, and instead of having a back and two arms, they have only one arm, which leaves an open side to the seating space. When two of the chairs are placed together, the armless sides to, the combination becomes a settee. Tête-à-têtes may also be arranged as well as attractive-looking, swastika-shaped, party-of-four settings. A table of mission style adds further beauty to the garden set.



Adaptable Garden Furniture Made in Mission Style. Above: Combining Two Chairs Produces a Settee

Convenient Combinations Are Possible with These Garden Chairs. Upper Right: A Tête-à-Tête Arrangement. Below: The Table and Four Chairs

AUTO TEACHING SIMPLIFIED BY MOVING PICTURES

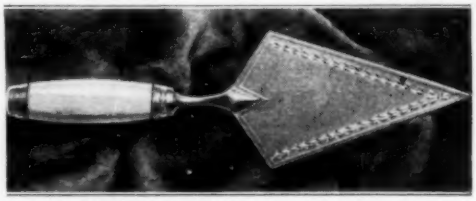
Part of the Y. M. C. A. course in automobile instruction is the showing of the internal parts of the engine and chassis in actual operation by means of so-called X-ray moving pictures. These are not really X-ray photographs, of course, but specially drawn views which give the effect of seeing through and into the opaque parts. Engine study by the new method is exceedingly interesting, the gas movements during the four strokes—suction, compression, explosion, and exhaust—being clearly shown, as well as the travel of the pistons and valves.

SEARCHLIGHTS CONTROLLED FROM A DISTANCE

Searchlights require movements of rotation about a vertical and a horizontal axis. At one time the control about the horizontal axis was limited to a depression of about 30°, and an elevation of about 60°. In later models the light beam could be raised to a completely vertical direction. This is necessary in anti-aircraft service, and in this work, particularly on ships, it is desirable to be able to control the searchlight from a distance. Originally this was done by a system of link motions, but this has now been superseded by a method of transmitting the motions electrically. In this apparatus, the projector itself does not move, but the beam of light is reflected into any direction by means of a plane mirror. On a ship the projector may be mounted at the foot of a hollow mast, with the beam of light projected to a mirror at the masthead capable of rotation about its horizontal and vertical axes, by means of electrical control operated at any desired location.

TROWEL OF GOLD LAYS MORTAR FOR BANK CORNER STONE

In laying the corner stone of a large bank building in Kansas City, Mo., recently, a trowel made of gold was used. As a complement to its golden blade, the trowel has a handle of ivory. It cost about $150. The tool measures 7 in. in length by 4 in. in width, and was presented to an officer of the bank after the corner stone was laid.



This Golden-Bladed Trowel was Used in Laying the Corner Stone of a Large Kansas City Bank

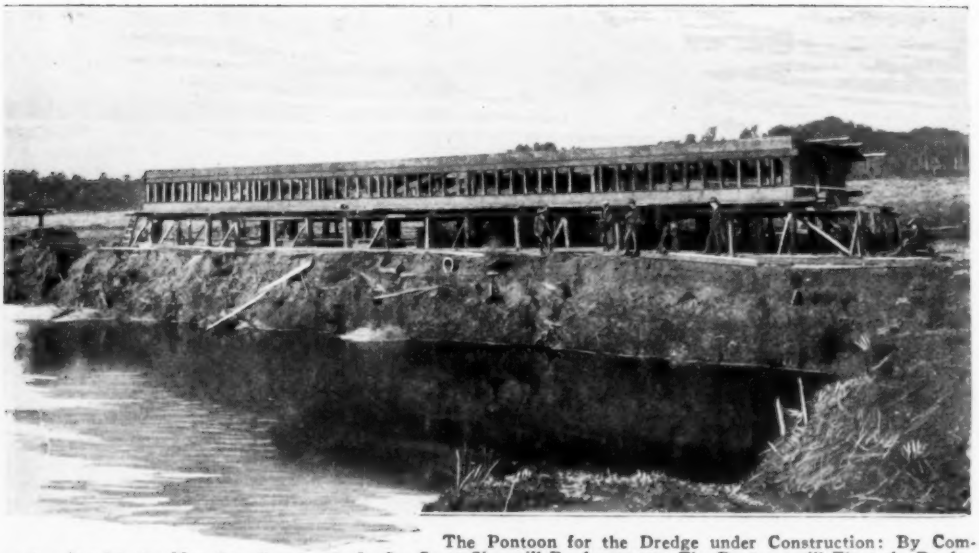
At the End of the Pipe Line a Connection is Made to the Nozzle That is Used for Washing the Gold from the Gravel. The Water at This Point Has a Pressure of About 100 Pounds per Square Inch

HYDRAULIC GOLD MINING IN NEW ZEALAND

THE original possessor of gold never gets it for nothing. It may be lying loose in sand, or it may be imbedded richly in quartz, but it costs the miner a great deal of labor, time, and money before he gets it so that he can use it. The gold miner, indeed, is a manufacturer just as much as is a maker of chewing gum, and the most he looks for is a profit on his investment. Often the gold miner's profit is not as great as the chewing-gum manufacturer's.

The new mining enterprise at Westland, New Zealand, is a good example of the large amount of preliminary work that has

A Part of the 18-Mile-Long Pipe Line That Conducts the Water from a Lake through Dense Pine Forests, and over Undulating Ground: The Pipe Line is Graded by Means of Log Supports Supplied by the Sawmill That Is Part of the Mining Equipment



The Pontoon for the Dredge under Construction: By Comparing It with the Men Standing beside It, Its Great Size will Be Apparent. The Pontoon will Float the Dredge to Any Part of the Mining Ground That can be Reached by Water

to be done in the development of even an alluvial gold field, where the gold is much more easily mined than in a quartz deposit. Alluvial gold mining is done with dredges, or by washing the sand deposits with water under high pressure, guided by a nozzle, in the manner of the fire hose. Large quantities of water are required, either for operating the dredges or for supplying the stream under pressure in the nozzle. In this New Zealand enterprise the water is conducted from a lake, by large iron pipes, a distance of 18 miles, through forests where the grading and supporting of the pipes entail a large amount of sawmill and erection work. There is a storage dam at one spot, capable of holding three days' supply of water, with a head that furnishes high pressure at the gold field. The water supply is sufficient to develop nearly 1,000 horsepower.

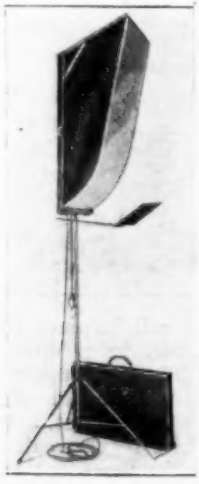
The Dredge under Erection, with Some of the Machinery Already Installed: From the Extent of This Structure It will be Seen Why the Pontoon Shown Above has to Be So Large

ELECTRICAL PRECIPITATOR TAKES DUST FROM SMOKE

A novel electric dust precipitator separates the metallic elements in the dust carried by the smoke from furnaces. It consists of a flue in which corrugated iron sheets are hung from the roof, and set parallel with the flue walls to act as collecting electrodes. Discharge electrodes consist of grids of small iron pipes suspended horizontally from supporting beams. The dusty gas passes through the electrified zone on its way from dust chamber to stack. There is selective action on the smoke that causes material of different metallic properties to be separated and collected in different hoppers suitably located. Butterfly dampers control the gas distribution and direct it between the dust chamber and the stack.

FOLDING PORTABLE FLASH LAMP CONTROLS ANGLE OF LIGHT

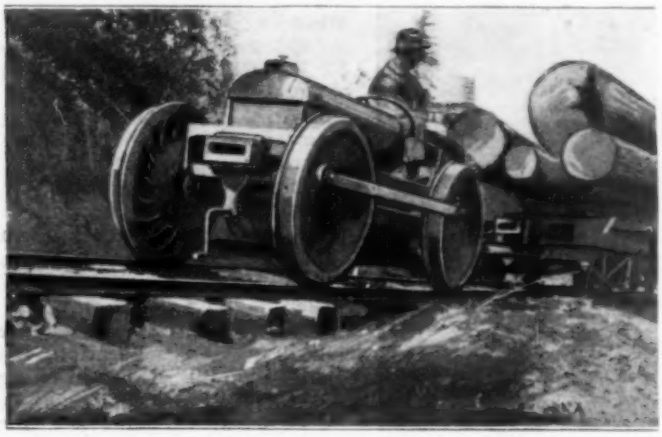
Lighting effects equal to those obtained under the studio skylight and independent of solar illumination can be had with an improved flash lamp for photographers. The device folds into a light and compact bundle and can be easily carried, which is of particular moment to the home portrait photographer. Also, the fireproof bag, inside which the flash is set off, can be tilted to any angle for properly illuminating the object to be photographed.



¶An Oregon restaurant owner keeps each of his tables supplied with small sheets of paper, 2¾ by 3½ in., bearing the invitation, "Please put your gum here and wrap." This frees the furniture of the usual chicle decorations, and saves much gum for the customers.

TRACTOR-LOCOMOTIVE DRAGS BIG TIMBER LOAD

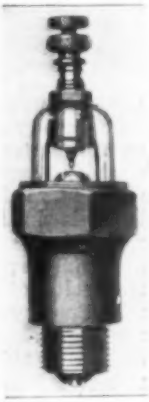
An Oregon lumber concern has equipped a small farm tractor with regular flanged railroad wheels and has made a very efficient locomotive of it. Steering gear being unnecessary, the power of the engine is distributed evenly, giving greater traction, and consequently permitting the pulling of larger loads. The locomotive thus improvised, runs on a narrow-gauge track and hauls huge loads of logs from the forest to the sawmill.



The Running Gear of This Tractor has been Changed for Adjustment to Railroad Tracks. Steering being Eliminated, the Tractor Power is Distributed Evenly to All Four Wheels

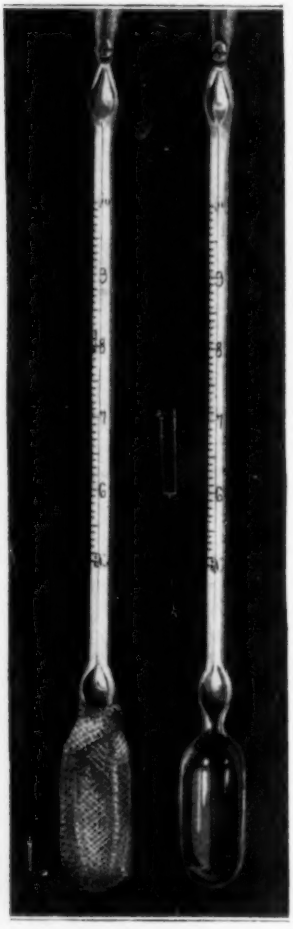
NEW SPARK PLUG HAS VISIBLE INTENSIFIER GAP

A new spark plug in which the insulator is transparent has been offered to the motoring public. The object of the transparency is to render visible an adjustable intensifier gap, built into the insulator body. The width of the gap can be varied, by means of an adjusting stem, while the engine is running. This has two desirable results: It enables the operator to determine whether current is passing through the plug, and if the latter is fouled, it will cause it to fire and clean itself by reason of the intensifying action always set up when a spark is forced to jump two gaps. The new plug is supplied in all the standard-stock pipe and metric sizes.



TWIN THERMOMETERS REVEAL WHY ONE IS UNCOMFORTABLE

Sensations of heat or cold, as experienced by a normally healthy person, are caused almost entirely by the condition of the surrounding atmosphere. If it is still, damp, and about 75° or more in temperature, a feeling of disagreeable heat and oppression results; while if of the same temperature, but dry and in moderate motion, no discomfort is felt. The reasons for this are that dry, moving air takes away bodily heat about as rapidly as it is generated, while damp, still air does not. Therefore in designing an instrument to determine whether atmospheric conditions are conducive to bodily comfort, other factors than temperature must be taken into account. For this reason the ordinary dry-bulb thermometer is unreliable and has been supplemented by another instrument of the so-called wet-bulb type, in which the bulb is inclosed in a fabric mesh bag which keeps it damp. To use, both bulbs are immersed in hot water until they register 110°. They are then removed, and the time required for each to drop to atmospheric temperature noted. The wet bulb will always cool more rapidly than the dry one. This difference in cooling rate serves to index the degree of comfort one should be experiencing, as it roughly indicates the moisture in the air and whether or not air is in motion.



HOT ROOMS MAY BECOME PART OF COLD-STORAGE HOUSES

Experiments conducted at the West Virginia University to determine the vitality of various species of insects, such as moths, carpet and grain beetles, under conditions of abnormally high temperatures, have shown that such vermin cannot live or propagate in a sustained temperature of 100° F. or over. This finding points the way to a solution of the somewhat vexatious summer storage of furs, clothing, seeds, grains, dried fruits, and the like. At present cold storage is the method used to protect these from the ravages of insect pests. Naturally it is difficult and expensive to maintain a low temperature in the storage houses when that outdoors is registering in the nineties. If the suggested methods are put into operation, instead of combating nature, those in charge of storage houses will accept her as an ally and, reversing present processes, increase the storehouse temperatures with the expenditure of very little fuel or power, to a point intolerable to insect life, but perfectly harmless to the stored merchandise.

SULPHUR PRINT OF OLD RAIL DISCLOSES CURIOUS FACTS

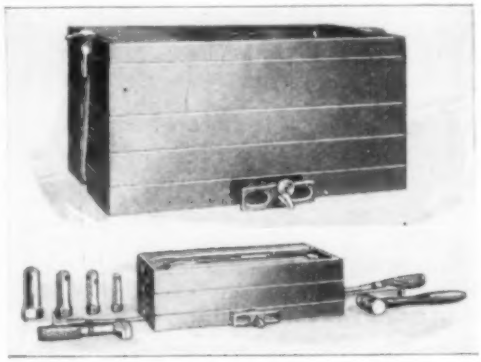
An old rail, laid, perhaps, about the year 1860, which has a hollow pear-shaped head, instead of the T-shape now in common use, was unearthed recently during construction work near Dayton, Ohio. In making a photographic print of the rail for analytical purposes, a peculiar method was utilized. After polishing the end of the rail, a piece of photographic paper, dipped in a dilute solution of sulphuric acid, was applied. The print thus produced indicated the presence of sulphur by darker shades, and its absence by lighter. The test revealed that there was little sulphur present in the head section of the rail and considerably more in the lower, which is a very desirable construction, as sulphur is a deleterious element in the working surface of steel rails. This section was rolled a channel and later bent into a rail.

EXPERTS STAGE TENNIS TOURNEYS ON REMARKABLE ROOF-GARDEN COURT

PROBABLY one of the best appointed tennis courts now in use is located on the roof of the Wanamaker building in Philadelphia. Despite its dizzy height of 15 stories from the earth, it lacks nothing in essential details for the convenient pursuit of that sport. Over the playing field, which is a wooden platform, prepared and arranged to simulate a clay court, is built a pipe superstructure covered with a close-mesh wire screen. The cage thus provided prevents the ball from flying out of bounds and off the roof to the sidewalk, far beneath. Experts in the game have selected the court to stage their most important tourneys, and deliver their smashing serves and returns without fear of losing the ball. Galleries capable of accommodating a large number of spectators are built at three sides of the court, and are arranged for a full view of the entire field by each spectator.

AUTO TOOL BOX IS ORNAMENT AS WELL AS UTILITY

As a rule automobile tool kits, or compartments, are carefully hidden under floorboards or seats, or, in fact, anywhere out of sight—and easy access. This is not true of a new tool box recently introduced to Parisian motorists. Recognizing that the kit is a necessary evil, the builders of this one have used polished aluminum and copper in its construction with the result that it is a beautiful running-board ornament. It is not, truly speaking, a box, but rather a group of five trays, each finished with tongue-and-groove edges to make them dust and waterproof. In them is a place for every tool, and with every tool in its place rattling is eliminated. The locking device is a novelty, consisting of two ribbons of tough flexible steel which, being wound up tightly on a shaft through the bottom of the lowest tray, clamp all together under a quite heavy pressure. As the trays are all metal, the only wood used being that in which the tool cavities are cut, warping is impossible.

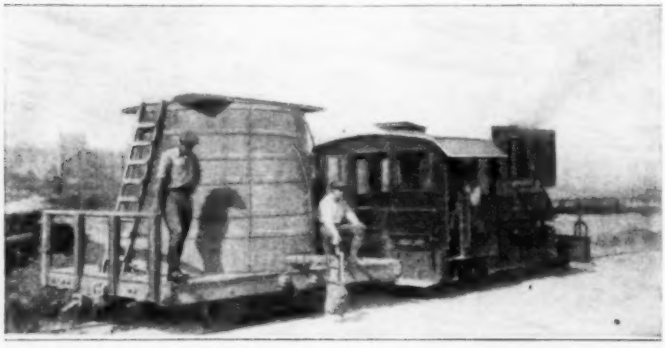


Above: The Multiple-Unit Tool Box, Made of Polished Aluminum, Assembled and Locked by the Steel Ribbons at the Ends. Below: The Three Lower Trays

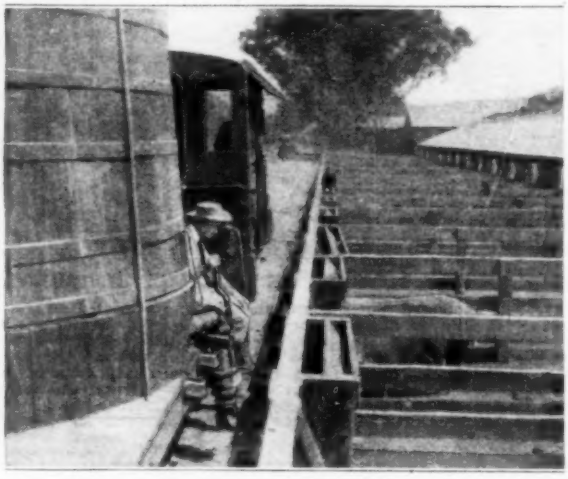
MECHANICAL FARM MINIMIZES HAND LABOR

By G. H. DACY

HARNESSING mechanical energy to perform the routine work of hired farm hands is the latest innovation introduced on a California ranch. The owner is raising and feeding thousands of pure-bred hogs in individual pens, and also fattens several thousand head of cattle for market. In order to simplify and expedite the feeding of these animals he has installed a miniature railroad system on the ranch. From a railroad-supply company he purchased a secondhand 18-ton steam locomotive, 40 flat cars, and five miles of standard-gauge track. His hog house—the largest in the world—is 1,200 ft. long, 26 ft. wide, and furnishes individual pens for 260 sows and their young. Each pen connects with a small yard. All these yards front on a central alleyway penetrated by the railroad track.



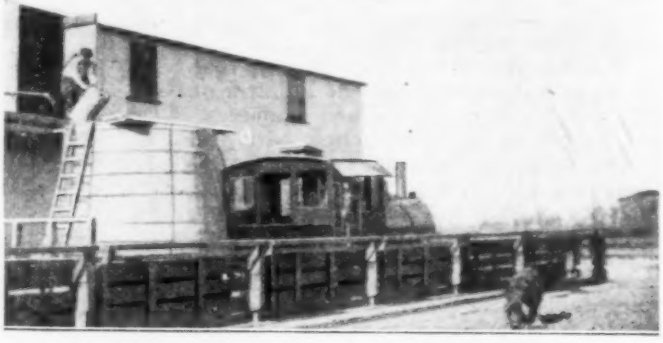
The Tank Holds 1,000 Gallons of Hog Feed. The Engine Weighs 18 Tons and the Unit Is Part of the Mechanical Equipment of an Up-to-Date Ranch



At Feeding Time, the Engine and Feed Car Travel on a Spur Parallel with the Hog-Pen Troughs. One Man Fills the Feeding Troughs, While Another Trips the Gates of the Individual Pens

There is a hinged gate at the front of each pen, which can be tripped by means of a lever, so that it swings outward at the bottom and renders the feeding trough accessible to the sow after it has been filled with feed. The locomotive, which is operated by an old railroad engineer, is used to haul a special feeding car, devised and built on the ranch. It is equipped with a 1,000-gal. wooden tank mounted on one of the flat cars. A series of rotary agitator paddles, operated by a 5-hp. steam engine at the front end of the car, serves to stir the feed inside the tank and keep it well mixed. A special outlet at the side and bottom of the tank consists of a 4-in. extensible rubber hose, and a hooded nozzle operated by a sliding lever.

The tank car is rolled under the second-story platform at the feed



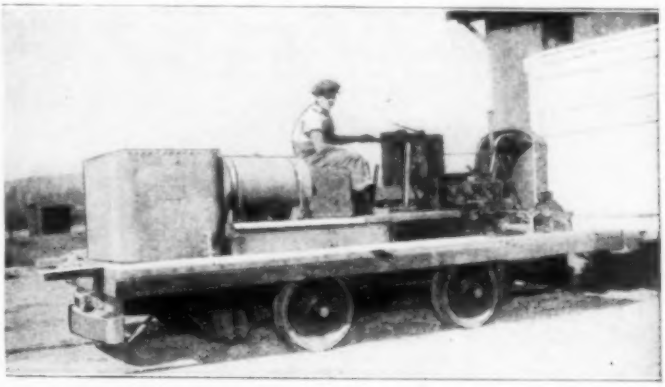
Loading the Tank with Wet Feed: As the Sacks of Grain are Dumped into the Tank, Water is Mixed with It from a Two-Inch Standpipe and the Mixture Worked to the Proper Consistency by Rotary Agitators, Driven by a Small Steam Engine on the Car

storehouse, and the grain is dumped into the tank, a 2-in. standpipe playing a stream of water upon the ground feed until the proper mixture is obtained. Then the paddles stir and mix the material thoroughly until it is of sloppy consistency. The feeding train then steams slowly—at a speed of about one mile an hour—down the feeding alley. One man operates the feed lever and fills the troughs as the car moves along the track, while another man trips the gates of the individual pens. A special device is now being constructed on the ranch, which will automatically trip all the gates in the desired sequence, thus eliminating the services of one attendant. The equipment permits the feeding of 5,000 hogs in exactly 60 minutes, where two workmen man the feed car and the engineer runs the locomotive.

This mechanical-feeding system is the only one of its kind in the world. It has been in use for over one year, and remarkable success has attended its introduction and standardization on the ranch. As an emergency engine for hauling the feed car in case the steam locomotive breaks down, the owner of the farm has invented a novel gasoline locomotive. He has mounted the engine of a discarded 60-hp. automobile on a specially rigged flat car so that this satisfactory and serviceable steel horse can be used as a beast of burden for the transportation of the feed car. The engine is geared down very low so that it can be operated at a slow speed without needless wear on the machine.

Cattle-feeding operations are also simplified on this ranch since the coming of the railroad. A number of the flat cars are equipped with special racks for feeding ensilage and alfalfa hay. A car is hauled directly under the silo chute and there loaded with feed, which has to be handled only once. The car is then hauled directly into one of the feed lots and left in a position where the cattle can eat the roughage directly from the car. When the feed is all consumed, the empty car is hauled away, and another loaded car replaces it. Alfalfa hay is handled in the same manner. Hand labor is reduced 75 per cent by the use of this mechanical method of feeding cattle.

The motorized farm has been with us for some time, and the use of power machinery as an efficient substitute for heavy hand labor is yearly becoming more common in our progressive agricultural sections, but the ranch under discussion has gone a step farther than any of its associates in adapting railroad facilities to the solution of its labor problems.



Breakdown of the Steam Engine would Be a Disaster Were It Not for This Gasoline Locomotive. It is Homemade, and is Used as a Substitute for the Engine

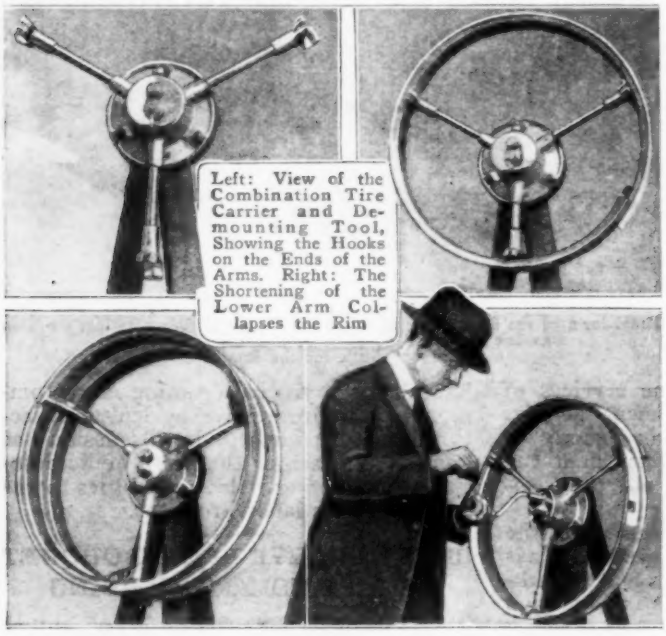
BEAUTIFUL RYE-BREAD BOUQUET IS GIFT TO MRS. HARDING

An unusual bouquet of roses, tulips, and violets was recently presented to Mrs. Harding. All the blossoms and foliage were made of rye bread. A single loaf of the bread was used and the flowers carved from it with a hatpin. Many hours of careful effort were expended in accomplishing each detail of size and shape. The sculptress, although an amateur, has produced in the novel tribute a real work of art.

A Curious Floral Gift to Mrs. Harding, Consisting of Tulips, Violets, and Roses Carved with a Hatpin from a Loaf of Rye Bread

NEW TIRE CARRIER IS ALSO QUICK-DEMOUNTING TOOL

A new automobile accessory which may become part of the stock equipment of many cars this season, is a combination one or two-tire carrier and quick casing-demounting tool in one. Three supporting arms end in hooklike fittings upon which the rim is held snugly. One side of each hook grasps the rim between its edge and the tire bead. The lower arm can be withdrawn inward, toward the hub of the device, by means of a gearing contained therein, which is actuated by turning a hexagon-headed nut, on its face, with a standard rim-nut wrench. As the arm shortens, the hook end grips the rim and collapses it so that the casing can be easily removed. To replace it the process is simply reversed. Expanding the arm to its limit wedges the rim so tightly that removing it from the device is impossible. The gearing within the hub cannot be turned until it is unlocked with the key especially fitted to it.



Left: View of the Combination Tire Carrier and Demounting Tool, Showing the Hooks on the Ends of the Arms. Right: The Shortening of the Lower Arm Collapses the Rim

Left: Equipped with Extension Hooks the Device is Used as a Two-Tire Carrier. Right: Extending the Lower Arm to Its Limit Wedges the Rim

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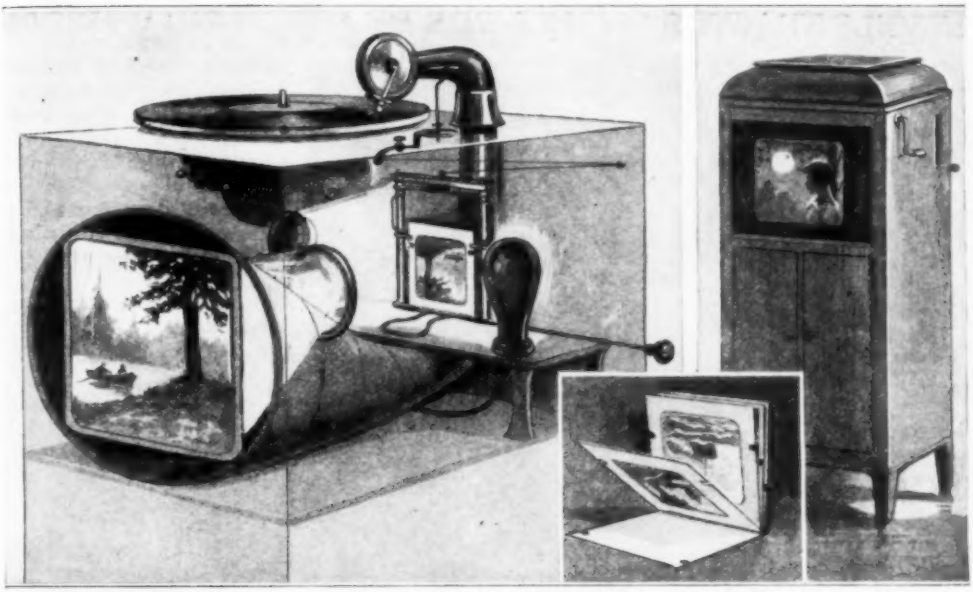
¶Sugar cane is being experimentally planted in China. $500,000 has already been raised for making the first plantations, and $1,500,000 will be needed if the results of the experiment warrant the erection of a factory.

COUNTING ELECTION BALLOTS WITH TABULATING MACHINE

The American Association of Engineers recently held their annual election of officers and directors, and they counted the votes by means of a tabulating machine. There were 18,000 voting members, scattered all over the country, and to each was mailed a ballot made up on a regular tabulating-machine card. There were 38 candidates for 12 offices, and these were tabulated so that it was easy for the voter to put a cross opposite the name of his choice for each office. The cards were all returned by mail to the home office, and on the closing day of the election they were all given to the punch clerk, who punched the number of the candidates voted for in the proper columns on a space on the card that provided for every candidate and office. The ballots were then counted on the tabulating machine at a rate of 150 per minute. These machines are not specially designed as vote-counting machines, being used more generally in work on statistics by railroad, insurance, and manufacturing companies, but they have been found to be great time-savers in other elections besides this.

PHONOGRAPH FITMENT SHOWS VIEWS ILLUSTRATING MUSIC

It is now possible to have illustrated-song entertainment in the home by means of a simple attachment that may be installed on any phonograph using the flat-disk records. A number of views, appropriate to the record played, occupies the space forward of and below the phonograph motor. It is held in a rack in such a way that the binder is downward. The views are not transparencies, but simply opaque pictures arranged in book form. They are illuminated by an incandescent lamp, and the reflected images are projected through a lens onto a screen placed in the front of the sound box. As the reproducer arm travels, it moves a small lever to which a cord is



Illustrated Songs by Phonograph. Left: Internal Arrangement of the Apparatus. The Travel of the Tone Arm Lowers the Wire Frame Which Causes the Views to Change at the Right Time. Right: The Books of Views are Inserted through the Slot at the Upper Right-Hand Corner. Insert: A Book Showing the Stagger-Spaced Notches

attached. The latter allows a light wire framework to slide downward along the edges of the book leaves. These are notched at different heights, the notch in the first one being the highest, and as the wire comes opposite the notches, each leaf falls in its proper turn and in perfect time with the music, disclosing the next view.

MOTORCYCLE FIRST AID FOR INJURED AUTOS

Almost overwhelming upkeep costs of a regular service and towing department, have led a Chicago motor club to supplant it by the installation of a motorcycle first-aid squadron. Each motorcycle unit comprises a cycle and side box, the latter being equipped with suitable compartments for holding a number of automobile-repair necessities. Statistics of the club disclosed the fact that only about 40 per cent of their service calls could not be successfully handled by the motorcycles, and that the saving realized in their use as aids to the remaining 60 per cent wholly justified their installation. In the event of wrecks or emergencies requiring towing or pulling, arrangements for such service have been made by the club with conveniently located service stations. Twelve of the motorcycles, dispatched by phone and headquartered in these service stations, patrol the roads of an entire county.

A Motor-Club First-Aid Squadron: It Patrols the Roads of Cook County, Illinois. The Motorcycle Side Box Carries Auto-Repair Necessities

LEVELS TRACTOR ON HILLSIDE BY ADJUSTING WHEELS

Above: View Showing How the Front Wheels of the Tractor Automatically Adiust Themselves to the Hillside

Out in Oregon, where much good farm land is far from level, an inventor has designed a tractor that remains practically horizontal, and maintains its traction on steep hillsides. The feat is accomplished by adjusting the relative levels of the rear wheels, which are mounted on stub axles and moved vertically by worm gears and pinions. The front wheels automatically shift to correspond, leaving the body in a level and stable position, free from any danger of overturning. The leveling also is of advantage in using the machine to drive a separator.

Plowing on Ground Which Has a Slight Slope: The Driving Wheels of the Tractor have been Adjusted So as to Retain the Machine in a Horizontal Position. The Front Wheels Are Self-Adjusting

BIG GUNS FENCE LONG STREET

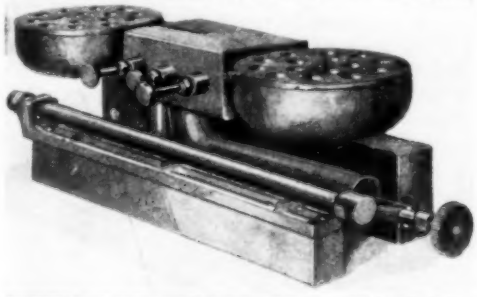
At the Mare Island Navy Yard there is a street which is lined for half a mile with 16-in. guns waiting to be mounted on warships. The breech of each gun is inclosed in a specially built little shack, and the gun itself is supported by a huge framework. Few people realize the great size and weight of the 16-in. guns until they

This Half-Mile-Long Street at the Mare Island Navy Yard might Aptly be Named "Peacemaker Boulevard," As It is Fenced on One Side of Its Complete Length with Huge 16-Inch Guns Waiting Their Turn to be Mounted on Battleships. The Shacks House the Delicate Mechanism of the Breeches of the Big Rifles

see, near by, a "big gun" of the Civil War that has been set up for comparison. It would be easily possible to store two or more of the latter in the little shed that houses the breech of the big guns of modern times. Sailors at Mare Island make the assertion that nowhere else is there to be found a street completely fenced by gun barrels.

PERFECT COMBUSTION FLAME CREATED BY NEW OIL BURNER

A kerosene burner in which a high-temperature flame is produced by the introduction of the right proportion of air, and which is economical because of its small requirement of fuel, has been developed for use in connection with cook-stoves, ranges, water heaters, and furnaces. It is controlled by valves which feed its three separate burners. Any number of the burners may be used in combination, or each may be operated separately. Flames issuing from the burners

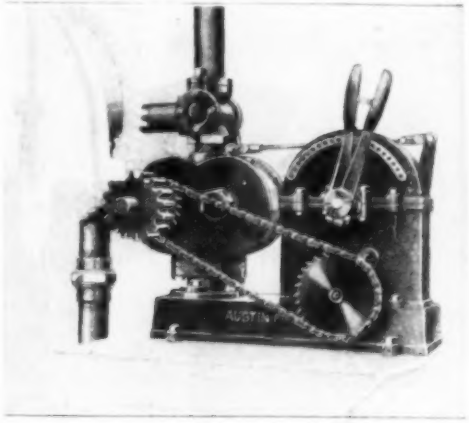


The Burners are Individually Regulated. The Unit is Placed in Stoves, Heaters, and Ranges, and by Adjusting Its Air Supply, Complete Combustion Results

are blue in color and are very quiet in action. They may be adjusted high or low, as the case demands, by regulation of the valves.

CONCRETE-MIXER METER PUMP REGULATES WATER SUPPLY

It is of great importance in mixing concrete that all of the ingredients should be properly proportioned, the water just as surely as the others. With this object in view, a device is installed beside the mixer, and has, mounted upon its base, an ordinary rotary pump, which is driven through gears by the mixer shaft. The pump spindle carries a sprocket which drives, by a chain, a timing device that is mounted beside the pump and on the same base. This device operates a two-way valve that is installed in the discharge piping from the pump. The valve is controlled by means of a cam on the timer, which is connected to a lever that is held in adjustment

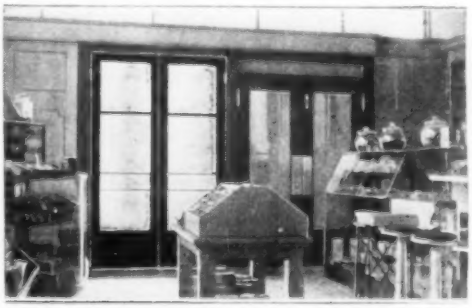


The Meter Pump Stands beside the Concrete Mixer Which Drives It. Beside the Pump Is the Timing Device That Operates the Two-Way Valve in the Discharge Piping

by a pin in one of a series of holes along an adjusting arc on the face of the timer. The position of this lever determines the quantity of water, and when this has been pumped into the mixer, the two-way valve automatically by-passes the water into a pipe that returns it to its source.

SCREEN AND WOODEN DOORS INTERCHANGEABLE AT WILL

In southern California the climate is so equable that either a light screen door or a heavy glazed one, is as likely to be seasonable in summer as in winter. Therefore, a storekeeper there fitted his store with a combination of the two, built in the same frame and running on an overhead trolley track, so that either could be rolled into the doorway, at any time, to suit the existing weather conditions.



The Light Screen Section of the Interchangeable Doors Is in the Doorway. The Glazed One on the Right can be Exchanged for It at Will

COMBINED FAN AND FACE MASK IS LATEST LONDON FAD

Startling rapid-fire changes of personality, by means of the fan mask—or mask fan—is the latest fad among London society belles this season. The fans are made in various forms, some of the folding type with a conventional decoration on one side and an idealized or caricatured human likeness on the other, while others take the form of two broad leaves, hinged by a spring handle which normally keeps them folded, with the mask part concealed behind the decorated one. In the latter model, compressing the handle moves the mask out from behind the concealing leaf and before the user's face. It may well be imagined that many a gallant escort has been badly disconcerted when, turning his glance for a moment from his companion, he has returned it only to be confronted by a grotesque visage in the place of the fair one he expected to see.

BABES OF IMMIGRANT MOTHERS BEGIN LIFE PROPITIOUSLY

When a baby is born at sea to an immigrant mother, it is the custom to take up a collection among the ship's first and second-class passengers for the benefit of the new arrival, and it is said that at times as much as $2,500 has been raised and handed to the mother. This has become widely known, and births at sea are greatly on the increase. The London registrar-general reports that at present births on ships leaving and arriving at British ports average about three a week.

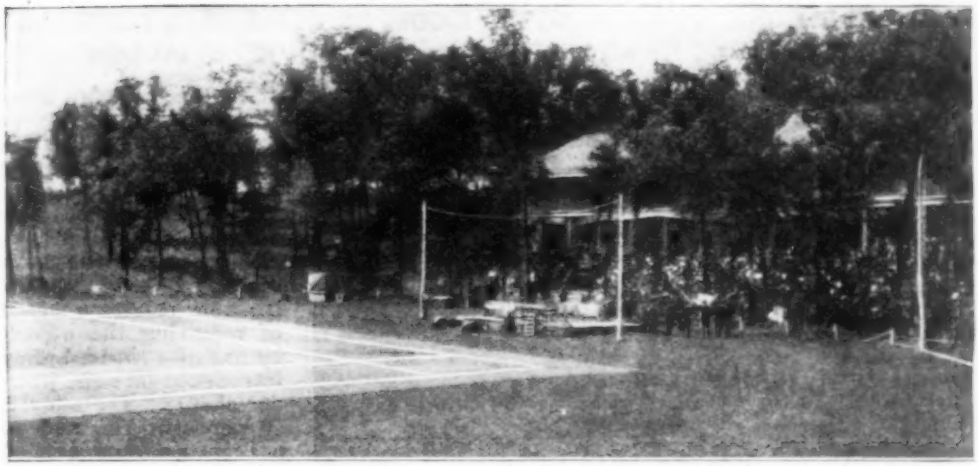
¶Grafting external ears on a three-months-old infant, who had been born without them, was the interesting surgical feat recently performed in an Omaha, Neb., hospital. Strips of skin from the thighs supplied the missing parts. The operation was performed in stages and required several weeks.

FIREMEN FOUND AND MAINTAIN CITY PARK

By B. J. JENKINS

WATERLOO, Wis., is indebted to the civic pride in the hearts of her fire laddies of 15 years ago for her beautiful playground, as it was these foresighted men who had not only the vision but also the determination and energy to make it a reality. The site of the park is a natural amphitheater with rolling hills forming the vantage points and the bed of an old slough an ideal athletic field. When purchased 15 years ago, the 34-acre tract was worth $3,400. Draining the marsh and erecting buildings has cost, it is estimated, about $50,000, most of which has been raised by the firemen through athletic entertainments. However, a great deal of the amount has been donated by public-spirited citizens. That the money has been well invested is attested by the fact that the city is acquiring a state-wide reputation as a gathering point for

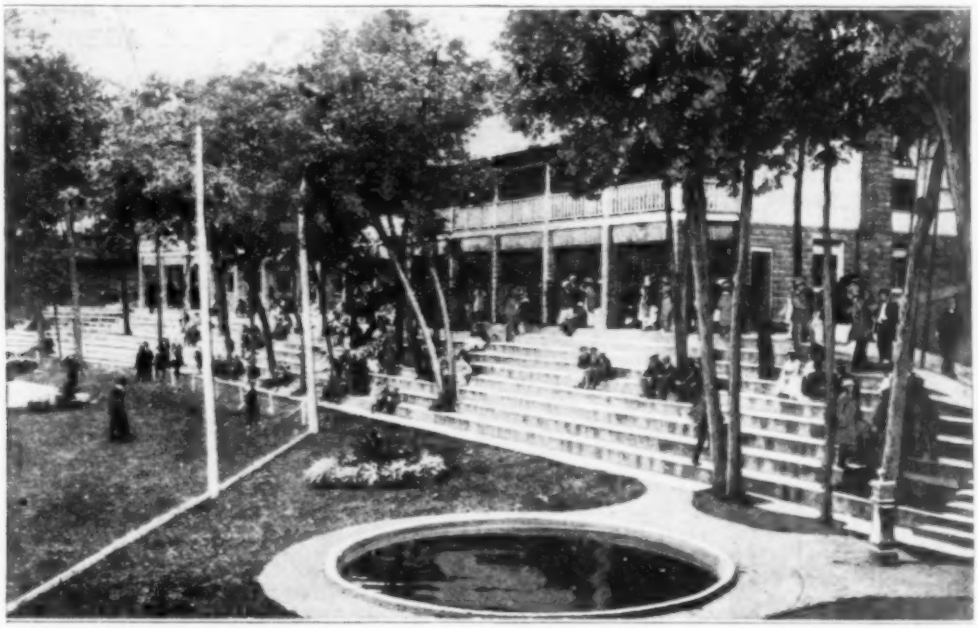
The Two Bandstands Are Examples of the Thought Bestowed upon Small Details of the Park Layout. They Are Two-Story Structures, the Ground Floors Serving as Refreshment Stands



One of the Reasons Why Waterloo, Wisconsin, Firemen's Park is Becoming Famous among Motorists of the Central Northern States: The Shady Camping Places Extend an Invitation Which Tourists Gladly Accept

picnics, field meets, auto tours, and the like.

The main building is a splendid two-story pavilion, 180 ft. long by 50 ft. wide, containing dining halls, dressing rooms for athletes, and an 8,000-sq.-ft. dance floor. Extending along one side of the structure is a broad flight of steps leading down to the field. These not only form the approach to the pavilion, but also serve as grandstand seats from which to view the sports. Though the park and pavilion are such that any community might well be proud of them, the townspeople do not rest content, but continue to add to their attractiveness. Having been founded by the firemen of an earlier generation, the fine playground has been handed down as a heritage of the department, and no matter how much other departments of the municipality or private citizens may contribute to its improvement, will probably always be known as the Waterloo Firemen's Park.



The Commodious Bungalow-Type Pavilion Contains Dressing and Lounging Rooms, Shower Baths, and an Assembly Hall with a Floor Space of 8,000 Square Feet, Used Also for Dancing. The Broad Stone Steps of the Commodious Bungalow-Type Pavilion Serve as an Approach to the Building and an Amphitheater from Which to Watch the Games

HAND-EMBROIDERED FLAG FOR PRESIDENT HARDING

Two artisans connected with an eastern embroidery and military-supply company, have recently completed a very beautiful flag for President Harding. It is 7 ft. long and 6 ft. wide and is of Japanese floss silk. The presidential coat of arms has been worked in the beautiful fabric by hand, and approximately 45,000 stitches were required in its completion.

This Handsome Presidential Coat of Arms was Worked Entirely by Hand. 45,000 Stitches of Japanese Silk were Sewed In to Complete the Piece. It Is a Present to President Harding

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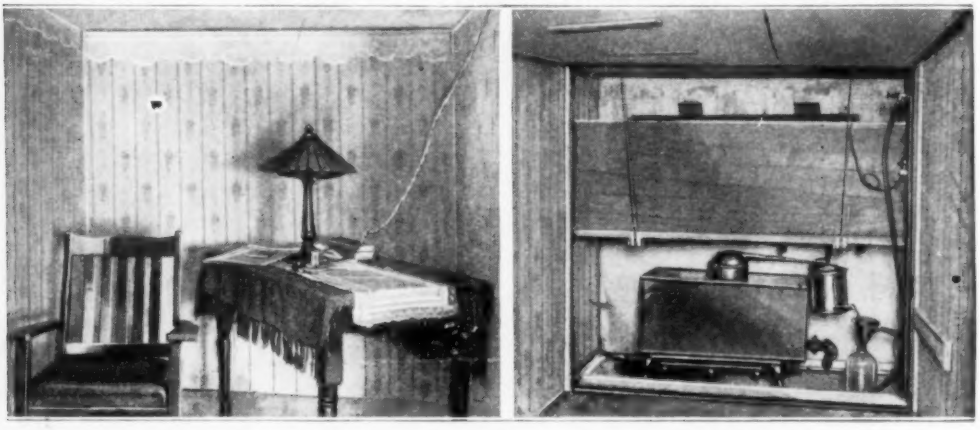
A novelty in automobile tubular radiators is one in which the tubes, instead of being solid, are made up of lengths of flexible metallic hose. These are assembled into groups, the number of the latter used in a radiator depending upon the size of the engine to be served.

COPPER DEPOSIT IN CANNONS REMOVED BY ALLOY

When a cannon has been fired a number of times a coating of copper, deposited to a small extent by each charge, accumulates upon the grooves and lands of the bore. This is detrimental to efficiency, and the U. S. ordnance authorities have recently tested, with satisfactory results, a means of removing the copper by use of a tin-lead alloy introduced into the powder charge. The alloy is 60 per cent tin, and 40 per cent lead, and is rolled into strips 1½ in. wide, and 50 in. long. About a pound weight of these was introduced between the front end of the powder bag and the base of the projectile, and 20 rounds were fired rapidly in a 16-in. 35-caliber gun. The copper deposit was completely removed, and the gun was then found to be as efficient as when it was new. This discovery will lengthen the life of guns.

CLEVERLY CONCEALED STILL FAILS TO FOOL U. S. AGENTS

A still for the manufacture of whisky in a private home, recently discovered by government agents, though hidden behind a cleverly devised screen, was found to be a very good example of mechanical construction. The outfit had a mash-

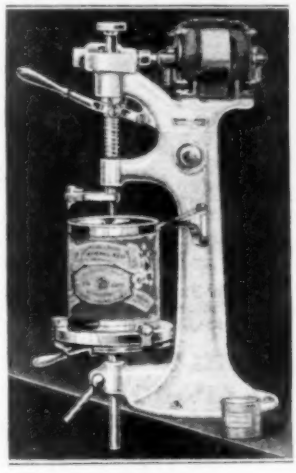


Behind the Wall of the Innocently Appointed Room Shown at the Left the Federal Agents Found a Prodigious Still. Right: The Still

reserve tank of 100-gal. capacity, a still and burner, a condenser, and residue-removal facilities, all neatly fitting within an alcove 5 ft. long, 7 ft. high, and 2 ft. deep. A flaplike curtain hinged at the top to the ceiling and decorated on the outside to resemble walls of the room, hung down across the front of the alcove, concealing the miniature still completely. The owner was a tinsmith.

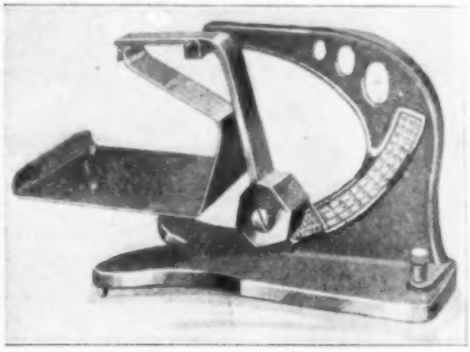
MECHANICAL CAN OPENER CUTS WITH SPEED AND PRECISION

A can opener designed to cut the tops from cans rapidly, and able to handle cans up to one gallon in size, is now being marketed. An enameled upright, surmounted by a ⅛-hp. motor, is fitted with an adjustable punching and cutting rig. This rig is an assembly of a puncturing point and knife, the latter being movably mounted on an arm extending from the rotating shank of the punch so that it may be set to the desired radius. The machine has a capacity of 12 cans per minute, the knife making 60 revolutions in the same length of time, accomplishing a very smooth cut. All the parts that are likely to become dirty are nickeled to permit polishing and sterilizing of the cans. While being opened the cans are held by clamping screws on a vertically adjustable plate.



LETTER SCALE IS SPRINGLESS AND ACCURATE

A scale for weighing letters and other light postal matter, and which has no springs, is now marketed. It consists mainly of three members, a base, a bent lever, and a receiving pan. A letter when placed in the pan will pull downward on one end of the curved lever and cause its opposite end to move upward. As this occurs, a pin, also on the opposite end, travels across an indicating dial which registers ounces and indicates rates in cents. The pan and lever are suspended from an upward projection of the base.

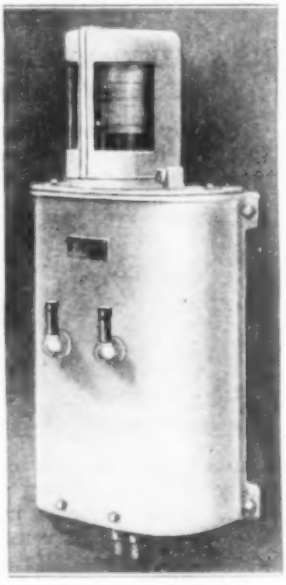


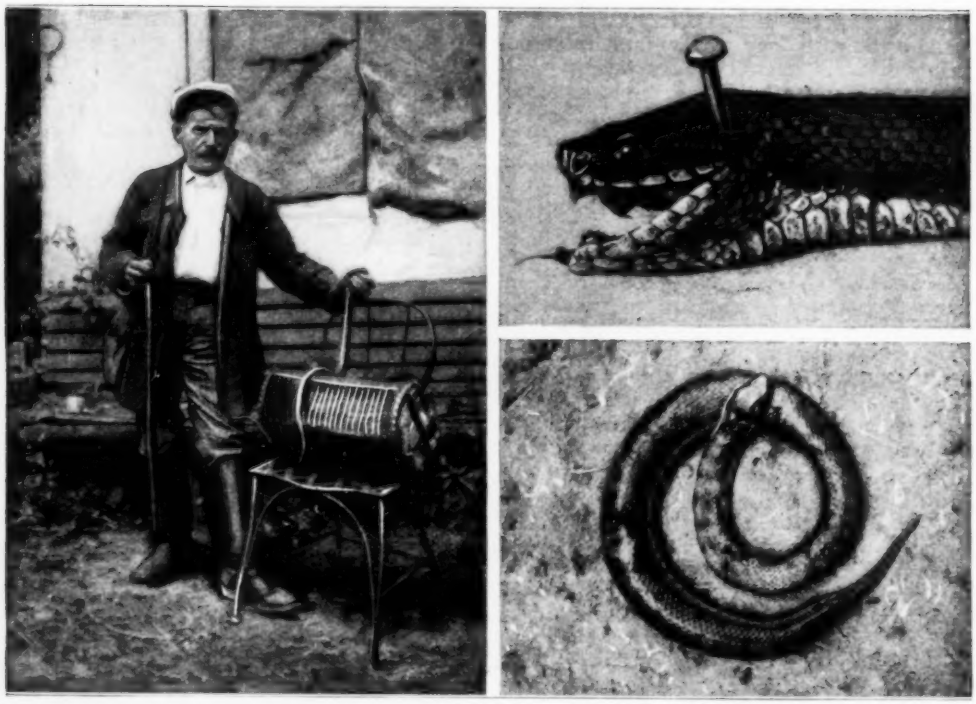
The New Postal Scale Uses a Properly Counterweighted, Curved Lever in the Place of a Spring. It will Weigh Articles Up to 12 Ounces

The scale will weigh articles up to 12 ounces, and because of the absence of springs, is considered very accurate.

BOILER DRAFT INDICATOR RECORDS VARIATIONS

The old-time U-tube, formerly used to record draft-pressure variations, has a competitor in the form of an automatic recorder which marks the variations on a removable chart. Floating on a water seal contained within a cylindrical vessel and guided centrally upon a small rod, is a bell to which is attached a pen protruding through the top of the vessel. The pen makes contact with a 24-hour rectangular chart, 4 in. high, and 14 in. long, on which it records the variations. A connection is made by piping to the space above the bell float from the boiler setting, at any point beyond the fire box. A second connection to the outside atmosphere is made below the bell, and the difference in the two pressures will cause the bell to act.

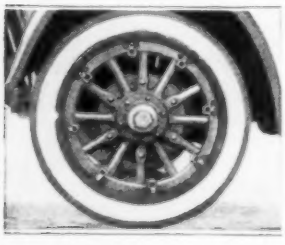




The Man Whose Picture Appears at the Left Hunts and Kills Vipers, Which Abound in France. His Armament Consists of a Forked Stick, a Scissors, a Handbag and a Knife. Above Is a Picture of a Viper's Head Showing the Mouth and Fangs. Below: A Viper Coiled to Strike

NEW AUTO RIM LUG RELEASED BY HALF TURN OF NUT

A newly invented quick-action demountable rim lug for automobiles is so made that the wedge part is hinged, at its inner end, to a fitting which screws onto the studs already in place on the wheel. The wedge is divided, except at its outer end, the division being deep enough to pass over the stud end easily after the locking nut has been loosened. This latter is made eccentric, so that the only movement necessary to loosen or tighten it is a half turn to the left or right. When in the unlocked position, the wide division in the wedge permits it to pass over the narrow sides of the nut easily, and to drop back on its hinge, clear of the rim. Locking is a reversal of the process, the wedge being raised into position and the nut given a half turn.

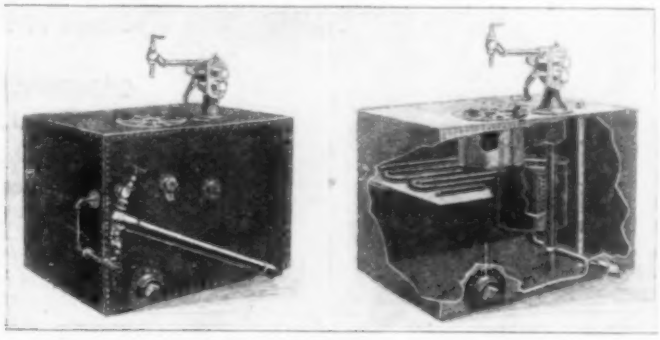


FRENCHMAN KILLS VIPERS FOR A LIVING

America has its rattlesnake. Continental Europe and the British Isles are bothered with a similar reptile known as the viper, and France seems to be especially burdened with a great number of these pests. Most of her districts, with a few exceptions in the northern part, are infested with them. Many men make a business of hunting the viper, and one Frenchman in particular has become so efficient at the business that he has been dubbed "John the Serpent." He wears heavy boots and carries a hunting outfit consisting of scissors, a forked stick, a knife and a handbag. Going about from vineyard to vineyard, he hunts out and kills the vipers, receiving pay according to the size of the snake caught. The snakes rarely exceed 3 or 4 ft. in length, and their body, slightly puffed at the neck, thickens toward the middle. Their coloring is mostly gray and deep brown, with a slight tinge of red. This tint scheme is covered by a series of black and red spots. Green and yellow predominate in the female, with a similar array of black and red spots.

FILTER FOR CUTTING OILS CLEANS WITHOUT CLOGGING

A new cutting-oil filter cleans by the precipitation and straining processes. It is built in the form of a two-level tank, the top compartment being the settling tank, and the bottom the straining chamber and storage space for the clean oil. The upper level contains a coil of steam pipe which serves to heat the dirty oil to a high temperature. This, it is claimed, so thins the mixture that the heavier foreign particles sink and settle on the bottom. The oil next flows to the lower part of the tank by gravity, passing upward through a cloth strainer. It is removed as needed with a hand pump. A noteworthy feature of the device is that the oil is kept fluid by heat during the whole operation, thus preventing the congealing of the compounds containing lard oil. In this way clogging of the pipes and strainer is prevented. Samples of oil in the settling chamber can be drawn through a special valve.



In This New Double-Deck Cutting-Oil Filter Lard-Oil Compounds are Kept from Solidifying by a Steam Coil and a Steam-Jacketed Pipe

"CHEF" OF MIAMI AQUARIUM IS EXPERT ON FISH DIETETICS

Proper feeding of the finny captives is the principal problem in keeping them healthy and happy, according to the expert in charge of this work at the immense new aquarium at Miami, Fla. Live food being the natural diet of most fish, it is difficult to persuade them to accept dead matter, regardless of how well it may have been prepared. In fact, forced feeding is frequently resorted to. Then again, on the contrary, fish are natural gourmands, very prone to overeat, and become so gorged that digestion is impossible. One individual in such condition many times infects a whole tank, causing the loss of scores or hundreds of valuable specimens. For this reason feeding is done three times a week only, the larger fish in each tank being enticed to one side with coarse-chopped food, while the weaker members are fed elsewhere.

HOUSES MOVED DOWNHILL IN NOVEL FASHION

Three small houses poised near the edge of a 60-ft. sand bluff, presented quite a problem to a corps of San Pedro, Calif., excavators in devising a safe method of moving them to the lower level. An opportune landslide partly settled matters when it dropped one of the three to the bottom without damaging it, and landed it right side up. A slide was cut in the soft earth of the precipice for the two remaining buildings, and after harnessing them with rope slings, they were lowered without difficulty or injury. Because of their light construction, collapse during the transfer was feared.

An Opportune Landslide Moved One of the Houses Down the Hill without Injury to the Structure. The Remaining Two were Harnessed and Lowered on Skids

BOAT PROPELLED AND STEERED BY ONE MAN

A boat propelled by one man is in operation in Germany. The operator sits in the center of the boat, and drives the

WIDE WORLD PHOTO

The Man in Front is Driving the Boat's Propeller by Means of the Pedals, While with the Lines Controlled by His Hands He Operates the Rudder

propeller by means of bicyclelike pedals. With his unoccupied hands he steers the boat by two lines connected to the rudder.

PREHISTORIC-REPTILE FOSSIL FOUND IN CANADA

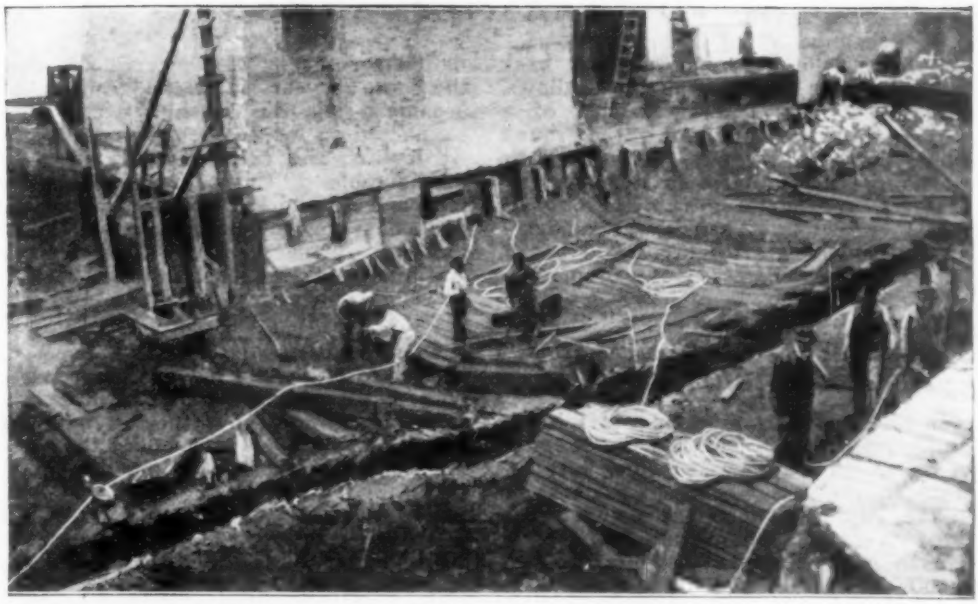
In the dim past, when so dim, indeed, that it is now quite indefinable, long before man appeared upon earth, there flourished, particularly in North America, a huge reptile known as the dinosaur. Occasionally a specimen is discovered that is so large that it would make an Australian kangaroo—which of existing animals it most nearly resembles—look like a kitten beside it. A particularly large skeleton of a carnivorous dinosaur was recently unearthed from the bed of the Red River, in Alberta, Can., and is now mounted in the American Museum of Natural History, in New York. This gigantic skeleton is specially proportioned for swift running, and it has been mounted in a running pose upon its greatly developed hind legs, with the body raised nearly upright, and the long tail extended as a balance. The salvaging, and subsequent mounting of a specimen of this kind, entail an immense amount of careful work, not only on account of the size of the bones, but also because of their fragility.

CEMENT-COATED MUD HOUSES A FUTURE POSSIBILITY

That the present generation may revert to a modified form of the adobe house as a solution of the housing problem, is suggested by a St. Louis, Mo., architect, who recently erected a small demonstration building, made entirely of native soil, in that city. The walls of the 10 by 13-ft. building were made by tamping a wet mixture of clay and loam into wooden wall forms, identical with those used in concrete construction. After seasoning, the exterior was plastered with cement to prevent weathering. It is claimed that the little structure is as solid as a rock, and that the 18-in. walls will equalize temperatures, making it warm in winter and cool in summer. Two unskilled laborers worked 11 days to lay the 460 cu. ft. of wall, equivalent to 10,000 bricks. Building authorities estimate that the cost of construction was 50 to 65 per cent less than that of a brick building of the same dimensions. That the structure will be durable is proved by tests of briquettes made of the material. These showed tensile strengths of 80 to 125 lb., and withstood crushing strains of 125 to 475 lb. per square inch. Instead of cement, any of numerous cheap coal-tar products can be used for weather-

Built Entirely of Native Mud, Coated with Weatherproof Cement, This Experimental Building in St. Louis, Missouri, is Expected to Endure for Many Years

proofing. These take paint satisfactorily and can be finished with any of the house paints in general use.



The Remains of an Old Wooden Vessel Found 30 Feet below Ground in the Heart of San Francisco: The Men at Work are Tearing the Remains Apart with Steam Tackle, and Salvaging the Copper and Bronze Found upon the Massive Timbers

OLD SHIP FOUND UNDER A BIG CITY

San Francisco discovered an old wooden ship under the streets of its business section lately. Contractors, excavating a deep foundation for a new skyscraper with steam shovels, were hindered in their work by strange massive timbers found 30 ft. below the surface. They had accidentally stumbled upon the preserved remains of some strange buried craft.

The bronze-sheathed and copper-bolted hull measured 100 ft. in length by 30-ft. beam, and great interest was aroused by the puzzling location of the relic over a mile from any water.

The city's history revealed, however, that it was the "Euphemia," a bit of whose historic and romantic existence is as follows:

In the days of '49, when the mad stampede around the Horn to the new California gold fields was on, numerous ships were abandoned by their crews at the end of the journey, and left to rot on the mud flats of San Francisco Bay. But, in forming the municipal government of the fast-growing city by the Golden Gate, the first alcalde and the first ayuntamiento, or town council, bought the "Euphemia," and converted it into a prison ship. Those were "rough" days in San Francisco, and this, the first jail the city could boast, was tied to a wharf, and soon filled up.

A View from Astern of the Ship, Unearthed among High Buildings a Mile from Water: The Bow Is beside the Horses in the Background

An old sketch of the scene at this part of the water front reveals another ship, the "Apollo," converted into a saloon and lodging house.

As the city grew

and forced the waters of the bay back from the spot by filling in the shallows, the novel spectacle was formed of a strange ship sticking up out of the ground in the heart of the city, surrounded by substantial stone and brick structures.

During the next 56 years, the city attained great size. Then it was suddenly half leveled by a great fire. And had it not been for the necessity of a deep foundation for the latest edifice to rise over the spot, 72 years after the "Euphemia" became a jail, the old hull would have slumbered on for another 50 or 100 years. At it was, the contractors experienced considerable difficulty in removing the mud and sand-locked skeleton with modern steam tackle, but made a small fortune out of the sale of the heavy copper and brass junk found on it.

STRENGTH OF WHOLE TIMBERS TESTED BY HUGE MACHINE

Instead of testing fractional samples of lumber, and then calculating the strength of the whole, a new machine, just installed at the Forest Products Laboratory in Madison, Wis., tests entire timbers as large as 12 in. square and 30 ft. long. This huge mechanism, weighing no less than 80 tons, has a load capacity of 1,000,000 lb., enough to destroy any piece under test, and it subjects the specimens of lumber to either tension or compression. One important use to which it will be put is to determine how the strength of planks and beams is affected by the presence of knots or other natural defects.

The New 80-Ton Lumber-Testing Machine, Which Subjects Beams Up to 12 Inches Square and 30 Feet Long to 1,000,000 Pounds of Strain and Determines Their Strength When Affected by the Presence of Knots or Other Defects

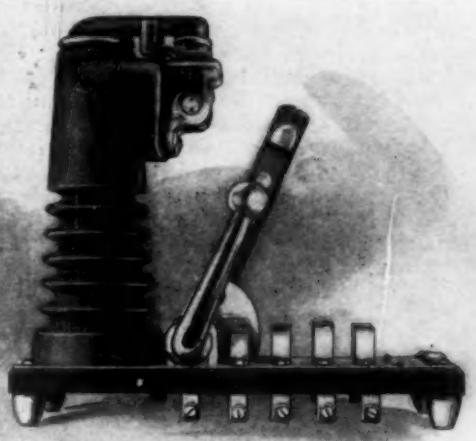
TWELVE YOUNG TREES NOURISH PIONEER ORANGE TREE

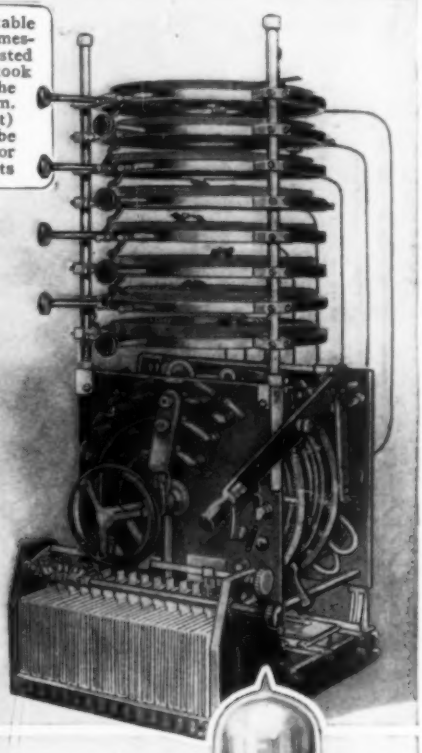
Early in the last century two navel-orange trees were brought into southern California from Brazil; and from these two trees have sprung the ancestors of the thousands of trees of this class that are seen in that state. The Department of Agriculture imported them and caused their buds to be grafted into other trees of that section. Now, their days of usefulness gone, the trees are kept alive as exhibitions of historical value. Not only are they carefully protected by iron cages, but they are kept alive by nourishment supplied by younger trees.

To sustain them 12 small trees were planted in a circle about the trunk of each tree. A metal band was girded about its trunk to prevent the running down of the sap. The trunks of the smaller trees were then bent over and each grafted to the trunk of the old tree. Their roots gather the sap and it flows into the older tree and thus prevents it from dying, as a tree of its age would naturally do. It will live as long as the young ones.

WIRELESS APPARATUS SHOWS VAST IMPROVEMENT

WHEN Marconi first brought to light his remarkable discovery and demonstrated his ability to send messages across the Atlantic ocean, wireless apparatus consisted of parts spread over great table space. The old equipment took up a whole room, and great electrical losses resulted in the long wires running between the apparatus to connect them. Today we have a complete wireless installation (upper right) mounted on one panel, and 20 such installations could be placed in the room formerly occupied by Signor Marconi for his one installation. This marks the great improvements

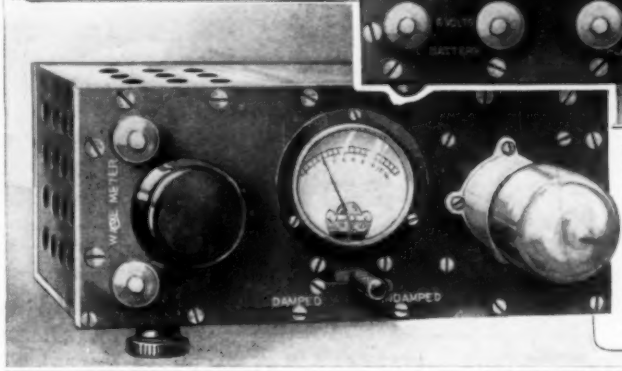




which have been brought about in these few years. Again, Marconi had to stop his electrical machinery and take his apparatus apart every time he wanted to change the wave length or vibrating period of the transmitter. With our latest transmitting unit, it is only necessary to turn a wheel as when driving an auto, and the apparatus can be placed on any wave length or tune desired. Seventy-five changes could take place before Marconi could make one adjustment on his old apparatus. These great improvements have been brought about by our American radio engineers.

The great inventor had to operate possibly five or six different electrical switches to control his entire equipment. The latest design in transfer switches, shown in the upper left-hand view, controls the sending and receiving apparatus simultaneously. The operator cannot send while the switch is in the receiving position, and vice versa.

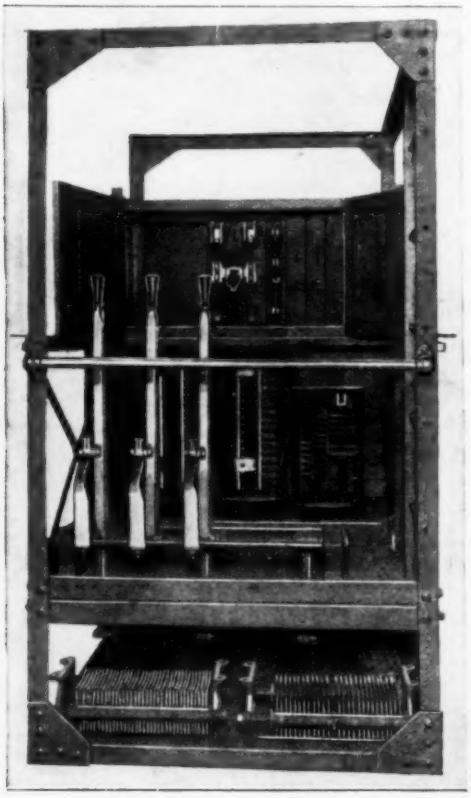
For the purpose of laboratory measurements there is a small



wireless transmitter (the two lower views) which emits both damped and undamped oscillations. When these oscillations are known to be of a certain definite value, it is possible to compute radio units by bringing them into resonance or causing them to have the same value as those of the transmitting apparatus. It is only necessary then to read directly from the oscillator and obtain the values sought.

TRAVELING-CRANE CAGE MADE SAFE FOR THE OPERATOR

The cab, or cage, of a traveling crane has necessarily to be made as small and compact as possible. In such a confined



The Doors of the Inclosures at the Back of the Cage Are Open, Showing the Controllers Below, and the Switchboard in the Cabinet Above

space there is danger to the operator from exposed knife switches, magnetic control parts, and resistors, and a cab has been constructed in which all these current-carrying parts are in a separate inclosure. The control is by means of radially pivoted levers located at the front of the cage, affording an unobstructed view of the crane hook, the runway, and the shop floor. There is no possibility of coming into contact with live parts, and yet everything is accessible by simply opening the hinged doors of the inclosure, when all parts are exposed for inspection and adjustment. The wiring is accessible by removal of a panel at the rear.

Resistance banks are mounted in a subbase, below a pair of trapdoors in the cage floor.

NEW OIL-BURNING STEAMER FOR U. S. CABLE SERVICE

Associated with the present great expansion of the American merchant marine there must be an extension of cable service under American control. To assist in this important work, a new cable-laying steamer, to be called the "All-America," is now under construction. This vessel will be 295 ft. long, with a beam of 37 ft., propelled by triple-expansion engines. The boilers, designed for a working pressure of 180 lb., are to be oil-burning, and the vessel will have a 500-ton bunker capacity, which will give it a wide working range. There are to be four cable tanks, three forward and one aft, with a combined capacity of 14,000 cu. ft., all equipped with the most modern accessories for loading and unloading cables. It is expected that the first cable laid by the new vessel will be from New York to Porto Rico, between which two points there is not at present an American-owned. Later, other cables for American service will be laid.

BOUQUET PRESERVED IN SILK BAG

Withering of the blossoms on his floral offering of love, need be no cause of concern to the modern swain, for they will stay fresh and beautiful if he uses a lately developed carrying envelope for them. This envelope is made with a waterproof silk lining and the roots of the plant are placed within it. The envelope also takes the place of a flowerpot and keeps the flowers fresh and beautiful. One Aus-

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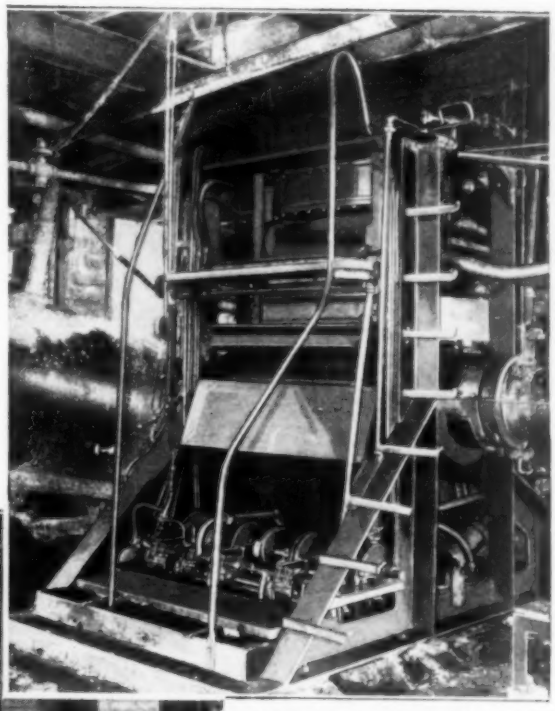
The Envelope Takes the Place of a Flowerpot and Keeps the Flowers Fresh and Beautiful. It is Made with a Waterproof Lining of Silk

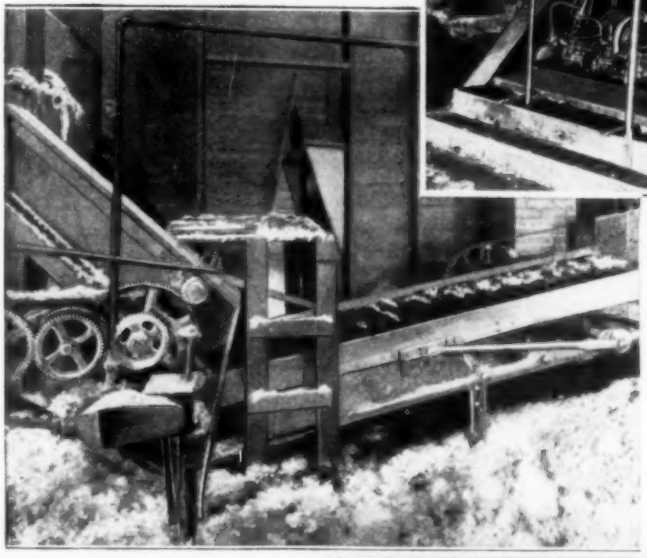
tralian young woman has, it is said, carried the bouquet of her lover for more than a year, in this manner.

LIMESTONE WOOL MADE INTO HEAT INSULATORS

For use as a heat insulator, an inferior grade of limestone found chiefly in the neighborhood of Alexandria, Ind., is quarried, made into a wool, and later formed into suitable shapes. The raw limestone is first melted in a coke-fired furnace, from which it issues in a continuous white-hot molten stream. Against this stream of stone a jet of steam is played, which causes it to turn into a fluffy threadlike substance resembling wool. The product thus made is called "limestone wool" and is shipped in sacks to a manufactory of insulating products.

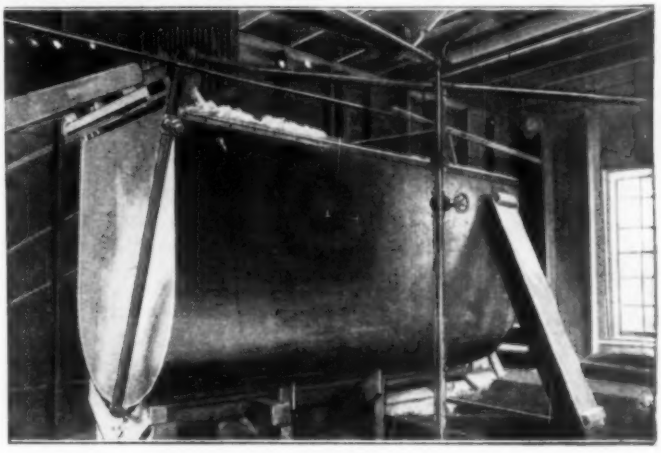


After Shredding and Mixing with a Binding Substance, the Mineral Wool is Felted by This Machine



Mineral Wool, Made of Limestone Heated to a Molten Form and Subjected to a Spray of Steam, is Shredded in This Machine. Right: A Receiving Tank Where the Shredded Wool is Immersed in a Binding Substance

Here the sacks are dumped into a conveyor leading to a shredding machine which tears up the material and shakes out a useless mass of small glass beads which form in the manufacturing process. After shredding, the wool is mixed with a binding substance and sent to a set of receiving and discharging tanks integral with a forming machine. This forming machine consists of a screen, or former, located on a rotating turret, and the mixture is fed to it through a set of valves. Here it is shaped into pads for use. The pads leave the machine au-



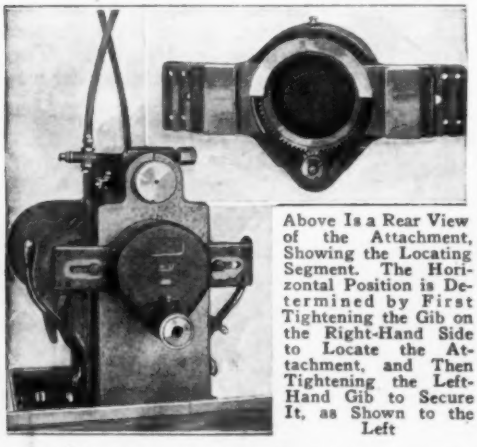
tomatically and are given a final compression before they are loaded on cars for

The Finishing Touch to the Mineral Wool Is Its Shaping into Various Forms for Use as Heat Insulators on Pipes, on Ovens, and Elsewhere

the drying ovens. After drying, they are trimmed for shipment.

HIGH-SPEED ATTACHMENT FOR MILLING MACHINES

A high-speed milling attachment has recently been brought out for use on a well-known make of milling machines. It is simple in construction and easily attached, no auxiliary fixtures being required. The attachment is positively located vertically by means of a segment that rests upon the spindle box of the machine, the horizontal position being determined by adjustable taper gibs. The bracket and spindle support is a one-piece casting, so designed as to protect



Above Is a Rear View of the Attachment, Showing the Locating Segment. The Horizontal Position is Determined by First Tightening the Gib on the Right-Hand Side to Locate the Attachment, and Then Tightening the Left-Hand Gib to Secure It, as Shown to the Left

the mechanism from dirt and injury. The drive is positive, though simple, the only gearing being the large ring gear that fits on the taper-nose spindle of the machine, and the pinion on the attachment spindle. The cutter is held in position by the taper in the spindle, and is driven by the tenon. Cutters are readily removed by a releasing bolt, which is a part of the attachment and remains in the spindle. The attachment is built in two sizes for larger, or smaller, milling machines.

NEW BABES IDENTIFIED BY STRINGS OF BEADS

To avoid mixing children in maternity hospitals, a string of lettered identification beads is used. A portion of the bead wire is strung with ordinary white beads, and the empty section is reserved for the stringing of beads bearing letters which spell the name of the mother. This necklace is placed around the child's neck and the two free ends are sealed with a lead seal. The beads then cannot be removed

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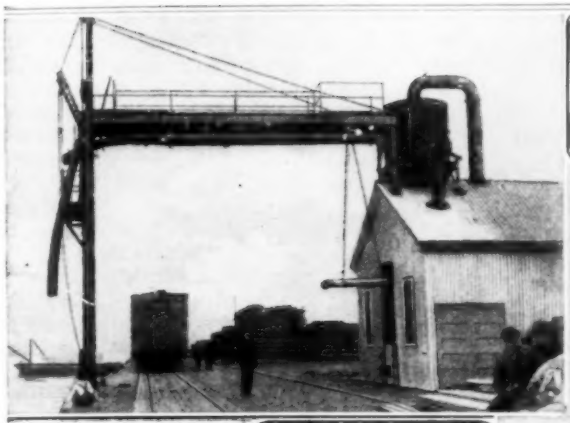
The Lettered Beads are Used in Maternity Hospitals to Avoid Mixing Children. They Spell the Name of the Child's Mother and are Sealed in Place

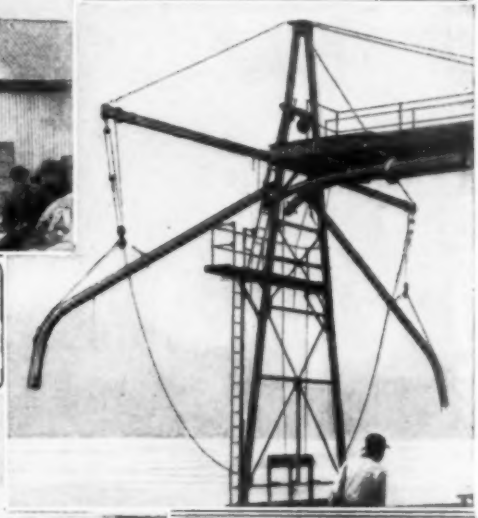
without breaking or cutting the string. When the mother leaves the hospital with her child, the beads are generally given to her as a keepsake.

AUTOMATIC SWITCH DEVICE TURNS LIGHTS ON AND OFF

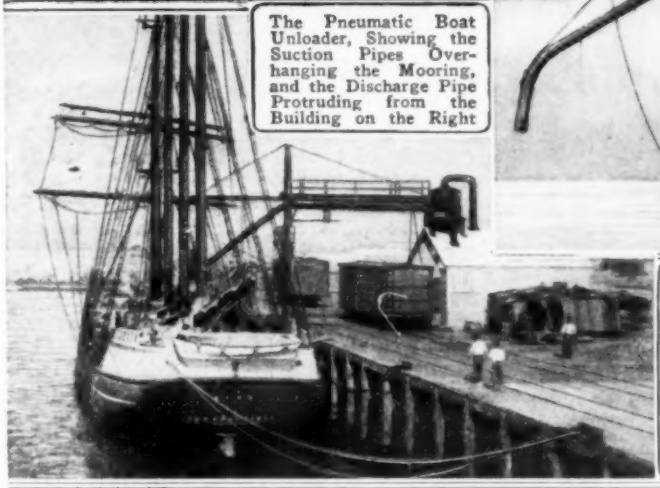
A recent invention furnishes a means of automatically controlling the turning on and off of electric lights. It operates in connection with an eight-day clock, on the dial of which an indicator is arranged to be set for timing the action of the device as desired. This controls the switches that open and close the electric circuit, and it is possible to add a special means of switching from a bright to a dim light, instead of cutting off the current altogether. The inventor has had one installed in a poultry house, where its particular purpose is to lengthen the hen's working day, and thus increase her productivity.



A Close-Up of the Unloading Pipes: These Pipes are Lowered into the Hold of the Ship and Suction Applied. They Draw the Grain from the Hold and It is Discharged at Another Point



The Pneumatic Boat Unloader, Showing the Suction Pipes Overhanging the Mooring, and the Discharge Pipe Protruding from the Building on the Right



A View of the Boat and Car in Position: The Suction and Blowing Fan Which Furnishes Power for the Movement of the Grain is Located in the Cylindrical Housing on the Top of the Building at the Right

PNEUMATIC BOAT UNLOADER ELIMINATES MUCH LABOR

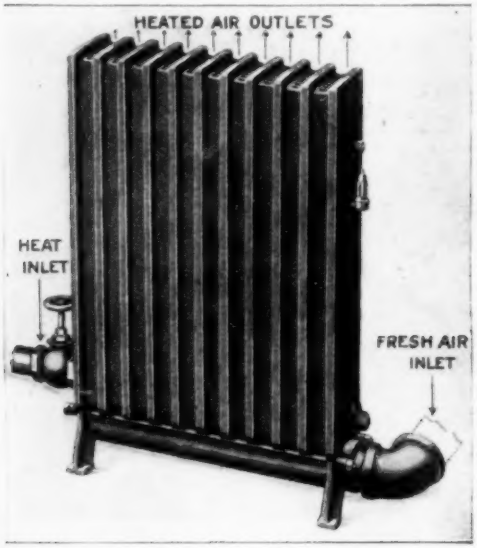
By sucking the cargo of grain from the hold of a ship and loading it therefrom into a car or warehouse, the need of many stevedores, and other dock labor, is reduced. Such a pneumatic device has been designed by a Pacific-coast engineer. A motor-driven fan, located centrally on the intake and outlet lines, forces grain out one end of the pipe and creates a vacuum at the other end. Thirty tons of light grains can be transferred in one hour by the use of this unloader, and the frictional heat caused by the rapid transit of the grain through the piping, kills weevils and other parasites, it is claimed. The grain packs as it is blown, and thus more grain than ordinary can be loaded into cars and bins. The device also aids in ventilating the grain, as it is necessarily shifted about from place to place during the transfer.

NEW PRESERVATIVE PROLONGS LIFE OF WOODEN POLES

A new preservative which is expected to surpass other compounds used for similar purposes, and with which it is claimed the life of wooden poles into which it is introduced will be prolonged by anywhere from 7 to 12 years, is being used. The fluid is composed of three constituents, one of high penetrating quality, such as zinc, magnesium, or calcium-chloride solution or a sugar solution, and a second of high antiseptic value, such as sublimate, phenol, or cresol. The third and very important element is one of long-continuing effect, consisting of a slowly soluble antiseptic or slowly decomposing metal powder. This constituent in combination with a granular substance, such as powdered glass, is used to protect the wood in the vicinity of the puncture through which the other preservatives are introduced.

VENTILATING STEAM RADIATOR SUPPLIES HEATED FRESH AIR

With the ordinary steam radiator the only way to get fresh air into a room is to open the window, and that either makes

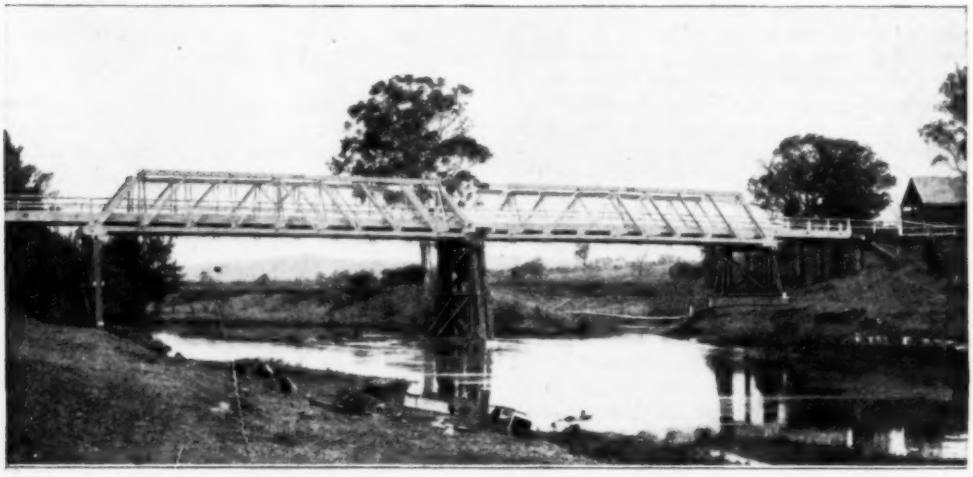


The Radiator is Shown in Position against a Wall Which the Fresh-Air Inlet Penetrates. The Heat Inlet is a Standard Steam Connection

the room too cold or consumes an extravagant amount of heat to keep it warm. The alternative is between too much of a good thing, or none of it. There is now a steam radiator that gives results equivalent to an open window, as far as the fresh air is concerned, but without the disadvantages of cold and draft. This is done by boxing in the steam coils of the radiator, and connecting this boxed-in space with the outside air by means of a pipe connected to the bottom of the radiator at the opposite end from the steam-pipe connection. The air pipe penetrates the wall of the room at right angles from the radiator. At the top of the inclosing box, between each pair of steam coils, there are a series of perforations. Thus, when the coils are hot, a draft is created which sucks the air through the inlet pipe, and discharges it, after being heated by the coils, through these perforations into the room. There is the same supply of fresh air as from an open window, but before reaching the room, it is warmed.

TIMBER TRAFFIC BRIDGE SPANS NEW SOUTH WALES RIVER

An interesting bridge, built almost entirely of timber and which is used for heavy traffic, spans the Barrington River of New South Wales, Australia. Two 90-ft. truss spans, and three 30-ft. plain-beam spans, make up the structure, which has a 15-ft. roadway from curb to curb. All but one of the piers which sustain the bridge are built of timber and rest on foundations of concrete which reach down to bedrock. This odd pier is of piling driven deep into the ground until the bearing afforded is sufficient to carry the spans without sagging. The bridge was designed to carry a load of 84 lb. per square foot, and because of the timber construction its cost was very light and the upkeep correspondingly low.



This Economical Timber Bridge Spans the Barrington River in New South Wales, Australia. It Has Three 30-Foot Plain-Beam Spans, and Two 90-Foot Truss Spans

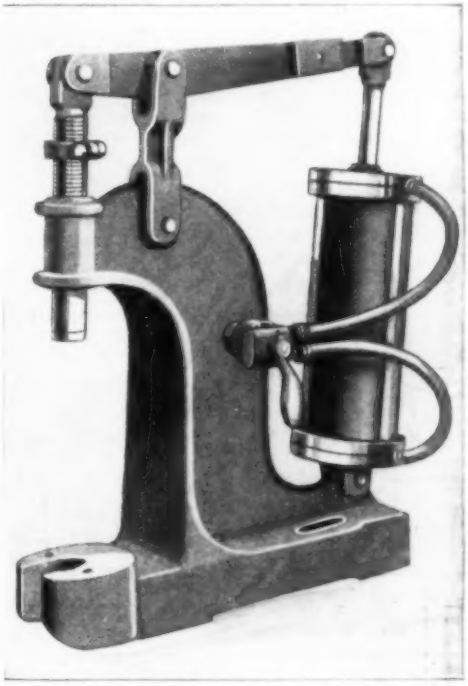
A 30-Inch Discharge Main Broke in the Hull of This Immense Suction Dredge and Caused It to Sink to the Bottom of the Willamette River. Efforts will be Made to Raise and Repair the Vessel for Further Use

IMMENSE SUCTION DREDGE SINKS IN OREGON RIVER

A giant suction dredge, belonging to the city of Portland, Ore., and which had a pumping capacity of 55,000 gal. of water per minute, sank recently in the waters of the Willamette River. A 30-in. discharge line which was extended from the vessel over pontoons to a point some half a mile distant, broke in the hull, quickly filling it with water. Fifty workmen about the ship scrambled to the deck for their lives, where they were later picked up and carried to safety, and the sudden rush of water smothered the fires in the boilers while the great dredge slowly settled to the bottom. A fireman off duty and asleep in his bunk was drowned.

AIR-OPERATED ARBOR PRESS WORKS WITH ONE STROKE

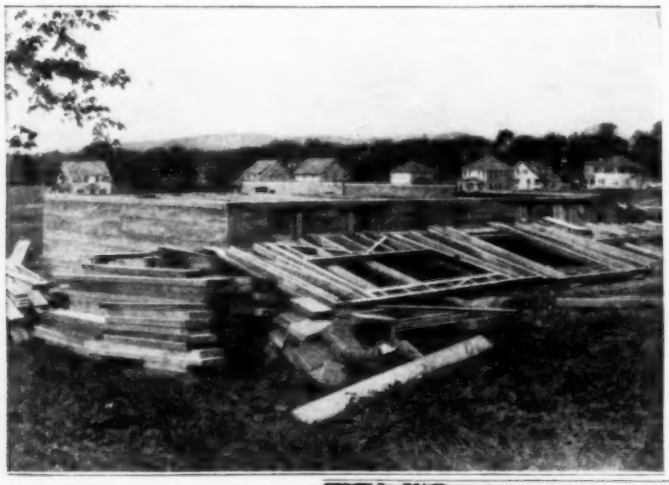
An air-driven arbor press which will force bushings and arbors in place with a single stroke, has been designed for use in the place of hand-driven presses. The new press has an air cylinder and a ram which are joined by a connecting rod. This connecting rod is held in a pivot lug which is bolted to a heavy cast-iron support, the support being cast in a single piece with the base. The base also supports the air valve and cylinder. To operate the device, the pieces to be pressed are placed on the base under the ram. The compressed air, when entering the cylinder, forces the piston upward, and the ram at the other side downward.



The Air-Driven Arbor Press Takes the Place of Hand-Operated Machines. It Presses with One Stroke

IMPROVED METHODS OF FABRICATING HOUSES

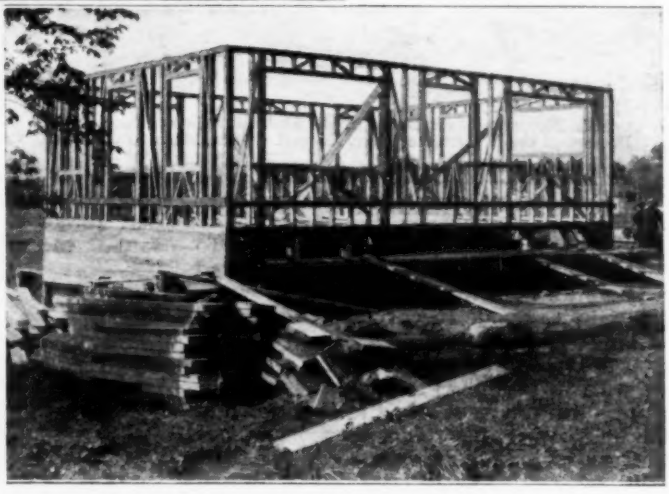
By A. N. SCOTT



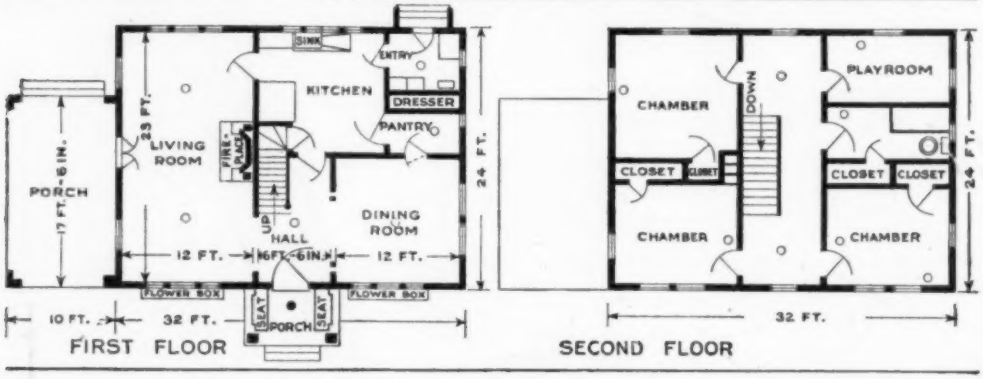
In the Background of the Picture Above are Shown a Row of Finished Ready-Framed Houses, and in the Foreground a Building under Construction, with One of the Ready-Framed Walls in Position to be Hoisted into Place Together with the Other Walls

THE serious crisis in our country's welfare brought about by the stoppage of home building, first as a necessary war measure and later forced upon us by the high relative cost of construction, is being met in a measure by standardized methods of design and assembly of houses. First we had the so-called ready-cut house with pieces sawed to the proper size and marked to fit certain positions designated on the plan. This was a distinct advance and saving in time and labor over the old method of hand-sawing the lumber on the premises.

A still further advance in home construction has recently been made by the introduction of the "ready-framed house." This method is exactly what the name implies, as all four walls are actually put together in sections at the mill and shipped



Above, the Ready-Framed House under Construction Has the Four Outside Walls of the First Story in Position Ready for the Flooring



Plans of the First and Second Floors of the Ready-Framed House Shown in Course of Erection in the Illustrations Above: The Plans are All Dimensioned, and It will be Seen That the Building will Make a Comfortable Seven-Room Home

on flat cars ready for quick erection at their destination. By having this part of the work done for him, the home builder is saved the large amount of time which would otherwise be consumed in sorting over and arranging the parts of the side-wall studding when it is simply cut to fit. The cellar walls, sills, and rough flooring are prepared as usual, and when ready, the sections of the sides are placed around the foundation, in the order of their erection, which is determined by the numbers appearing upon them. The actual time of raising the four walls of the house pictured here was 38 minutes with four men, while only a few hours later the second floor and upper walls were in position ready to receive the roof rafters.

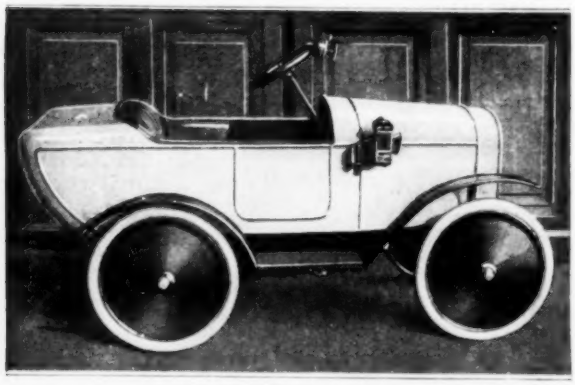
The Ready-Framed House Completed and Ready for Occupation: The Work of Erection is Done in About as Many Hours as It would Take Days in the Ordinary Way

This efficient method of framing originated in New England and is a modernized adaptation of the system of brace framing developed by our forefathers of that section of the country. Most of the old New England homesteads were constructed in a similar manner. The side-wall frames were assembled flat upon the ground, and when everything was ready, all the homesteaders for miles around would gather for the "house raising," and nightfall usually found the house not only framed but roofed over and completely sheathed in. Semiautomatic machinery has, of course, changed all this and robbed the house raising of its former romance, but the builder can nevertheless get much satisfaction from his cleverness in utilizing space and waste material, and the artistic design of modern homes is unquestioned.

The lumber for these ready-framed houses is run into the mill and fabricated in sets of five, and then passed on to the assemblers, who nail the parts together and number each frame in accordance with the drawing. With the usual "tailor-made" houses from 15 to 20 per cent of the lumber is wasted. With this newest method, however, all pieces 2 ft. or more in length, are used for braces, each stud being held firmly in place by the diagonal arrangement of this bracing. Another advantage, not generally recognized in connection with houses made on a large scale, is that, due to quantity buying the manufacturer can select the proper wood for any particular location in the house, whereas the small contractor must stick to one or two kinds of wood throughout. For instance, fir flooring is the best for the piazza floor, as it will stand alternate wetting and drying without tending to rot.

After all the frames and other parts have been fabricated, they are loaded on flat cars which are of just the proper width to accommodate the frames, and of sufficient capacity to carry the material for one house. The cement, sand, chimney brick, and such heavier materials, are more economically purchased at the point of erection, but all other parts are included. This method of brace framing the side walls and interior partitions gives a much more rigid building than could possibly be secured by the straight-up, or balloon-type, of framing, as each stud is held firmly in place by these braces. Provision is also made for bolting the sills, and consequently the whole structure, to the foundation with heavy ½-in. bolts, a feature which is omitted in a great many houses. A house put up in this way is so firm and rigid that old Mother Nature is unable to rack it, and when the inevitable shrinkage comes, no unsightly cracks will appear in the plaster, nor will the baseboards draw away from the floor, as so commonly occurs in houses built in the usual haphazard manner by speculative builders.

¶ Full citizenship with all the rights pertaining thereto has been granted to Thomas Blackbird, a full-blooded Sioux Indian, as a recognition of his services in the late war. This establishes a precedent, as all other Indians are classified as wards of the government and are not entitled to the vote.



Were the Bicycle Pedals a Little Better Concealed, This French Leg-Power Toy Car could Easily be Mistaken for One of the Midget Autos Becoming Rather Common in Europe

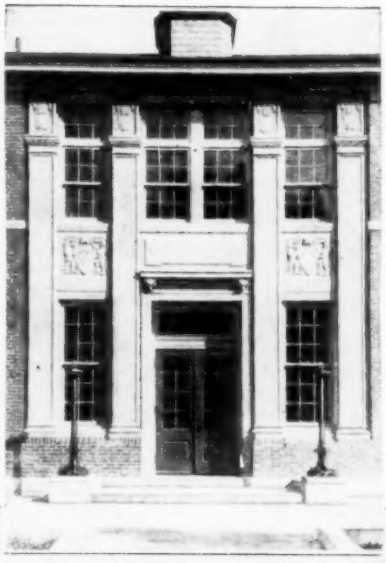
CHILD'S LEG-POWER AUTO LOOKS LIKE REAL CAR

Among the many original and beautifully made playthings with which France is making a bid for the world's toy trade, is an automobile-speedster-type leg-power car, which at a distance can be easily mistaken for one of the midget cars being produced in several parts of Europe. It is fitted with disk wheels, pneumatic tires, side lamps, and a real horn, mounted on a conventional steering wheel. A hood, radiator, and sweeping fenders, carry out the deception.

FIRST GOVERNMENT SCHOOL IN NEW ENGLAND

The graduation of the first class in the new government grammar school at Quincy, Mass., took place recently. This school, situated on North Street, was built by the government as a part of the United States Housing Bureau plans to care for the additional school children coming to the city on account of the 250 new homes being constructed. The school was not finished when the war stopped, and was not completed until the fall of 1920.

This is the first government school ever built except on an Indian or other government reservation. It is of brick with glass roofs, and affords plenty of sunshine and fresh air. It contains 16 rooms and a hall, together with rest and coat rooms for the teachers, and every room is connected with the open air so that, in an emergency, all the rooms can be emptied at a minute's notice. Some of



This School, Located in Quincy, Massachusetts, Is the First Institution of the Kind Ever Built by the Government outside the Confines of a Military Post or Indian Reservation. Above: The Main Entrance Conveys an Idea of the Excellence of Construction

the rooms are fitted for anæmic children, and these will practically be in the open air.

The housing bureau, in consideration of the number of new families it brought to the city, agreed to build a school in the new district and give the city the right to use it for five years without cost. At the end of the five years the city has the option to buy the building.

TELESCOPING DROPLIGHT IS HANDY APPLIANCE

A droplight equipped with a telescoping bracket and which is fastened to the ceiling, has lately been produced by a French designer. A swivel fitting is attached to the ceiling and the bracket which is pivotally hung, is fixed to it. This bracket being of telescoping design can be raised and lowered within a considerable range. Also the light may be rotated in a circle. Being attached to the ceiling, the fixture is of considerable advantage over a desk lamp, as it takes up no room.

PHOTOGRAPHS TEACH LANGUAGE IN CORRESPONDENCE COURSES

The phonograph has long been recognized as a help in learning foreign languages in the absence of a teacher. Photography now has its inning in a plan recently worked out by a professor in the University of Oregon and used in the Spanish correspondence courses of that institution. Students learning Spanish by their own firesides, the teacher being 500 or 1,000 miles away, had their greatest difficulty with pronunciation, until this teacher, recognizing that Spanish has absolutely fixed rules in this respect, and that the lips are used more than in speaking English, devised photographic aids. A series of 19 pictures are sent out with the lessons on pronunciation. These pictures show the position of the mouth in pronouncing all the difficult vowels, diphthongs, and triphthongs.

The Spanish "U" is Sounded by Contracting the Lips and Opening Them in the Middle

Pronouncing Spanish "I." If the Mouth is Not Properly Shaped, the Pronunciation will Be Wrong

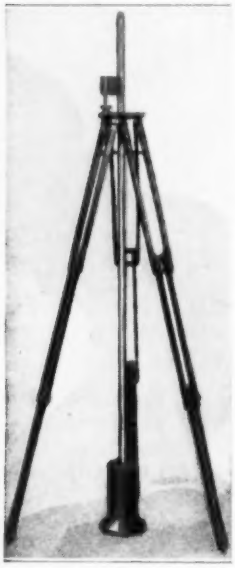
Spanish "A" Shows the Lips to be Widely Parted. By the Photo Method the Student Learns to Mobilize His Lips and Tongue to Produce the Right Sound

The idea is that if the mouth is formed to the correct shape, the issuing sound will be right. With the picture in front of him, the student can practice the sound until he gets it. This differs from the phonographic method, and in addition to being more economical, has certain other distinct advantages, for the talking machine gives only the proper pronunciation, which is often difficult for the student to copy because he does not know how to mobilize lips and tongue to produce the sound.

¶Many automobile tourist parties are traveling the recently completed all-Canadian route to the Pacific coast. The stretch between Creston and Kuskanook has been completed, and the Canadian Pacific Railway is maintaining a ferry service from the latter point, across Kootenay Lake, to Nelson.

INSTRUMENT TESTS SUBGRADE FOR CARRYING ROAD LOAD

An instrument for testing the solidity of the ground on which roads are to be built has been designed for the use of the Bureau of Public Roads by one of its officials. The instrument is built in the form of a tripod in which a central rod is loosely held. At the bottom this rod has a foot plate, 10 sq. in. in area, on which a second and movable weight rests. The latter weight is raised and dropped from a height of 10 ft., and the distance that it pounds the foot plate into the subgrade is recorded on a scale at the top of the rod. From the results obtained the fitness of the subgrade for carrying the road load is estimated.

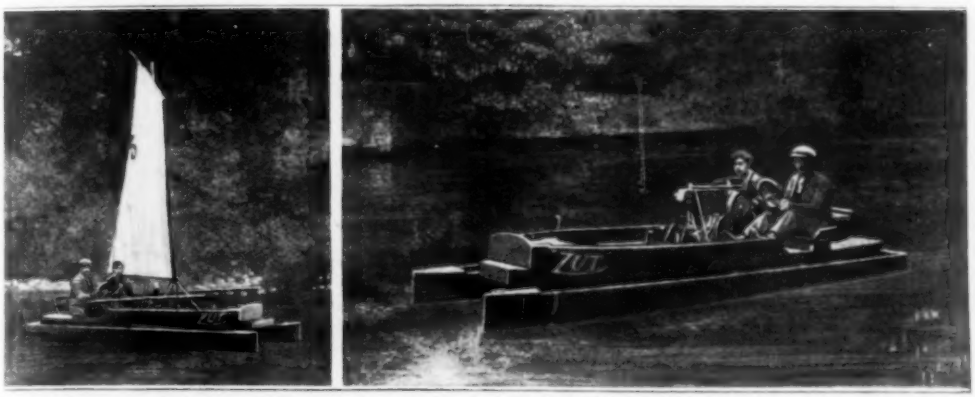


PILOTLESS AIRPLANE WRECKED BY PLUNGE INTO TREE

Like the horse which sometimes wanders homeward when left unattended, an unpiloted airplane recently flew away from an aviation field in southern California. The plane, however, did not succeed in wandering to its home hangar in Houston, Tex., as the horse might have done. It plunged into a tree and was wrecked instead.

The owner of the meandering airplane had flown from the Texas city to San Bernardino, Calif., en route to Los Angeles, where he expected to take part in an aerial tournament. Darkness overtook him near San Bernardino, so he landed there to spend the night, anticipating the renewal of his aerial journey next morning. The plane was securely pegged down on the field, but that night southern California was swept by one of those terrific windstorms known as "Santa Anas." The force of the wind was so great that the plane was wrenched from its moorings and soared away with the gale. As near as can be determined, the airplane described a 10-mile semicircle through the sky. Then it went into a nose-dive, and plunged 150 ft. into a tree, landing with its tail in the tree, and its wings and body astride a barbed-wire fence.

The Disastrous Finish of the Airplane's Pilotless Escapade: As Nearly as can be Determined, the Runaway Machine Described a 10 Mile Semicircle, and Then, Owing to Some Vagary of the Gale, Went into a Nose-Dive, Landing in the Position Shown



The View at the Left Shows the Amateur-Built Twin-Canoe Motorboat under Sail. The Nearer View at the Right Shows the Boat Propelled Exclusively by the Paddle Wheel—Not Visible —in the After Part of the Boat behind the Passengers

PADDLE-WHEEL MOTORBOAT BUILT BY FRENCH AMATEUR

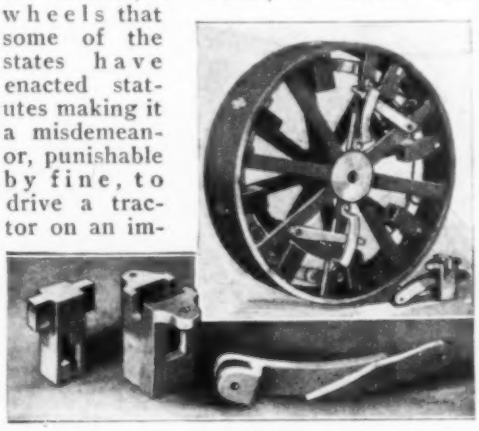
An ingenious young Frenchman has assembled a number of standard contrivances in such a manner that the result is a commodious paddle-driven motorboat. Two canoes, each 14 ft. long by 2 ft. wide, are placed side by side, with a 2-ft. space between them that is bridged by a sort of tonneau, which ties the canoes together, and furnishes a carriage for the passengers, and for a 2-hp. motorcycle engine. This, by means of a bicycle chain and sprockets, drives a paddle wheel supported in the after part of the space between the canoes, where also is a rudder, controlled from the driver's seat by a steering wheel. Carrying four passengers, it has a speed of four miles an hour. Its total weight, light, is 300 pounds.

ANTISKID FOR SHOES MAKES SLIPPERY WALKS SAFE

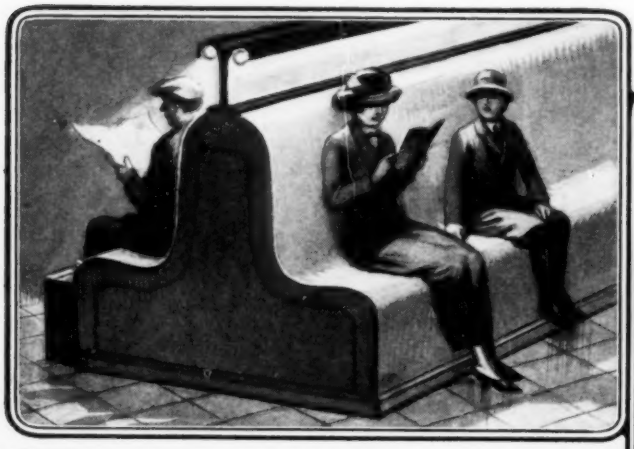
To assist pedestrians in maintaining equilibrium on slippery or icy surfaces, a small shoe cleat has been devised. It is semicircular in shape, with both ends turned up to form lugs. The contact surface has a number of sharp prongs that project downward and stick into the slippery surface. In applying the device, it is slid on the shoe sole until the side lugs and sole engage in a jam fit. It is also useful on grassy slopes, often encountered on park and golf course walks.

VANISHING TRACTOR-WHEEL CLEATS SPARE GOOD ROADS

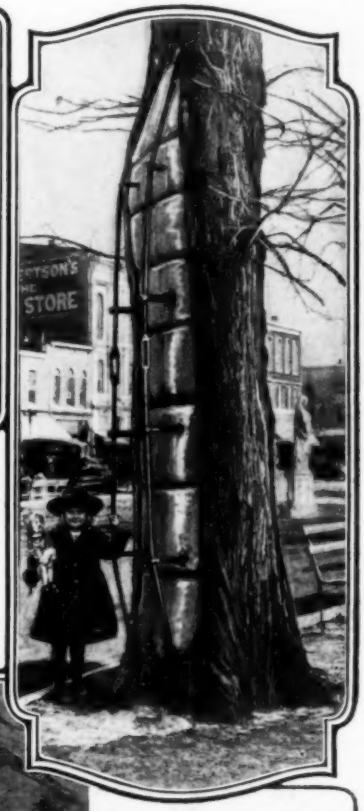
Good roads are damaged so badly by the strakes, or cleats, of tractor bull wheels that some of the states have enacted statutes making it a misdemeanor, punishable by fine, to drive a tractor on an improved highway without first removing the offending parts. In many cases this is impossible, as they are riveted to the rims. Where the construction is such that they can be removed at all, the job is a long, slow one on account of the number of bolts used. A newly invented wheel equipped with short cleats which can be instantly adjusted to protrude beyond the rim or to withdraw within the wheel until their edges are flush with the rim surface, gives promise of overcoming these difficulties. There are eight cleats to each wheel which are actuated, in groups of four, by means of two hand levers mounted on the outer face. Moving the levers toward the rim extends the cleats.



Above: The New Tractor Wheel with the Extensible Cleats Withdrawn Flush with Its Rim Surface. Below: Details of One of the Cleats and a Sliding Wedge

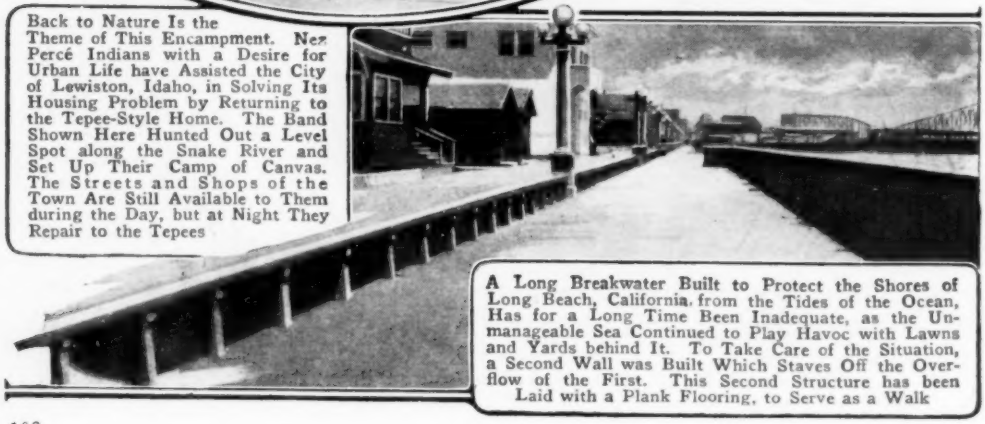


A Jacksonville, Florida, Railroad Station Has Long Double Benches over Which Double Rows of Lights, Covered by Reflectors, are Suspended. The Arrangement Provides Plenty of Illumination for the Perusal of Newspaper or Perodical, and Is a Decided Comfort to Passengers Who may be Detained There

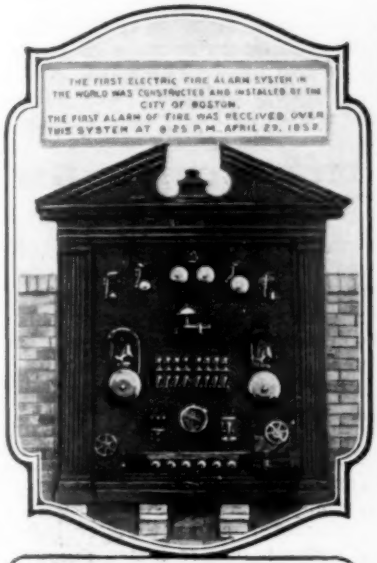


This Historic Maple Stands in the Public Square of Bowling Green, Kentucky. To Preserve It Some Heroic Tree Surgery has been Performed. After Removing the Decayed Wood, the Cavity was Filled with Cement. Iron Bars were Imbedded in the Cement, and Connected by Rods with Turnbuckles to Prevent the Tree from Curving Away from the Filling

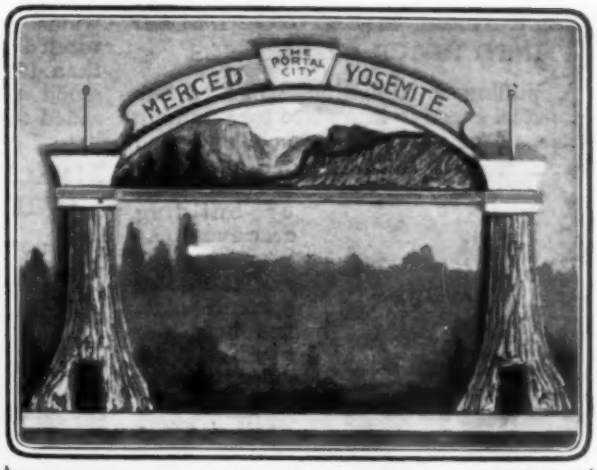
Back to Nature Is the Theme of This Encampment. Nez Percé Indians with a Desire for Urban Life have Assisted the City of Lewiston, Idaho, in Solving Its Housing Problem by Returning to the Tepee-Style Home. The Band Shown Here Hunted Out a Level Spot along the Snake River and Set Up Their Camp of Canvas. The Streets and Shops of the Town Are Still Available to Them during the Day, but at Night They Repair to the Tepees



A Long Breakwater Built to Protect the Shores of Long Beach, California, from the Tides of the Ocean, Has for a Long Time Been Inadequate, as the Unmanageable Sea Continued to Play Havoc with Lawns and Yards behind It. To Take Care of the Situation, a Second Wall was Built Which Staves Off the Overflow of the First. This Second Structure has been Laid with a Plank Flooring, to Serve as a Walk


THE FIRST ELECTRIC FIRE ALARM SYSTEM IN THE WORLD WAS CONSTRUCTED AND INSTALLED BY THE CITY OF BOSTON.
THE FIRST ALARM OF FIRE WAS RECEIVED OVER THIS SYSTEM AT 8.25 P.M. APRIL 29, 1852.

The First Electric Fire-Alarm Box in the World: It was Installed by the City of Boston in 1852, and the First Alarm was Received over Its Wires at 8:25 p. m. on April 29 of That Year. The Antiquated Signal Is Now in the Boston Fire Department Headquarters



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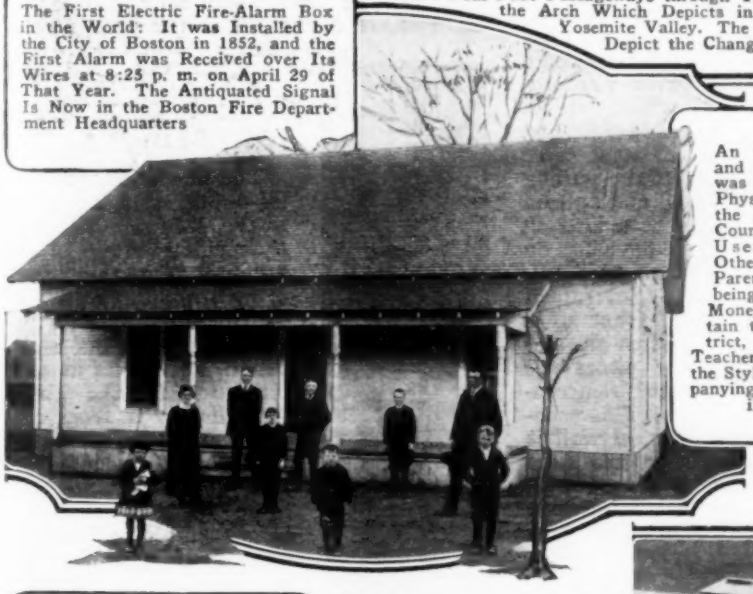
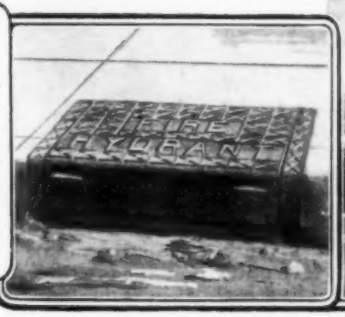
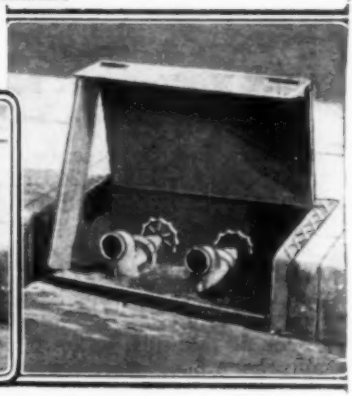
An Entry Arch to the City of Merced, California, Which, if Completed as Proposed, will Be Decidedly Representative of the Locality. Two Artificial Sequoia Trees, 14 Feet in Diameter with Four-Foot Passageways through Their Bases, will Support the Arch Which Depicts in Colored Bas-Relief, the Yosemite Valley. The Arch will be Lighted to Depict the Changes from Dawn till Dark



An Endowment of Money and 1,100 Acres of Land was Made by a Country Physician and Farmer, to the Alla District of Collin County, Texas. It will be Used for Housing and Otherwise Aiding Deserving Parents Whose Children are being Educated. Enough Money Is on Hand to Maintain the Schools of the District, Erect Homes for the Teachers, and Build Houses of the Style Shown in the Accompanying Picture for the Families of the Pupils

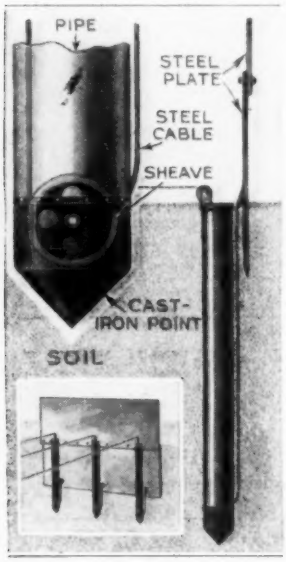




How Fire Hydrants are Protected from Destructive Collisions with Passing Vehicles in Long Beach, California: The Entire Protector Is Curb-High and Wide and is Made of Cast Iron. Nothing Projects Outward to Obstruct Moving Automobiles or Trucks, and the Consequence Is That the Hydrants are Not Damaged. In Case of Fire, the Cover may be Quickly Raised by a Pair of Handholes. Right and Left: The Cover Open and Closed

PLATE-STEEL SHEETING PULLED INTO PLACE BY ENGINES

A pulling combination which draws plate-steel sheeting into place for retaining quicksand or water-logged soil, and with which, it is claimed, pier or building excavations may be made at half the present cost, has been designed and successfully used by a western excavation contractor. The combination consists chiefly of a pulling engine and an iron-pointed pipe, driven into the ground, which serves as a fulcrum. A steel cable is threaded from the drum of the pulling engine over sheaves at the top and bottom of the pipe and is attached to a beveled shoe, or bottom plate. The beveling on the shoe plate assists the engine in pulling it down into the soil. Several of these pipes are arranged in front of a plate to be drawn down. When the engines are set in motion, the plates are pulled downward until it becomes necessary to attach additional plates. This process is repeated until a solid steel wall is sunk into the ground. After two such walls have been driven and braced with timbers at the top, the earth between them can be removed without fear of a cave-in.



SPEEDY MOTORBOAT DEFEATS TRAIN IN 1,200-MILE RUN

The water-line distance between New York and Miami, Fla., 1,260 miles to be exact, was recently covered by the racing motorboat "Gar II," the property of a Detroit, Mich., speed-boat enthusiast, in an actual running time of 47 hours 23 minutes, beating the official train time between these points by a comfortable margin of 21 minutes. The defeat would probably have been more decisive but for unexpected rough weather and adverse winds. Gasoline consumption for the trip totaled 1,800 gal., or an average of more than 1 gal. to the mile. The game craft stood the grueling well and was later sailed to Detroit via Albany and Buffalo.

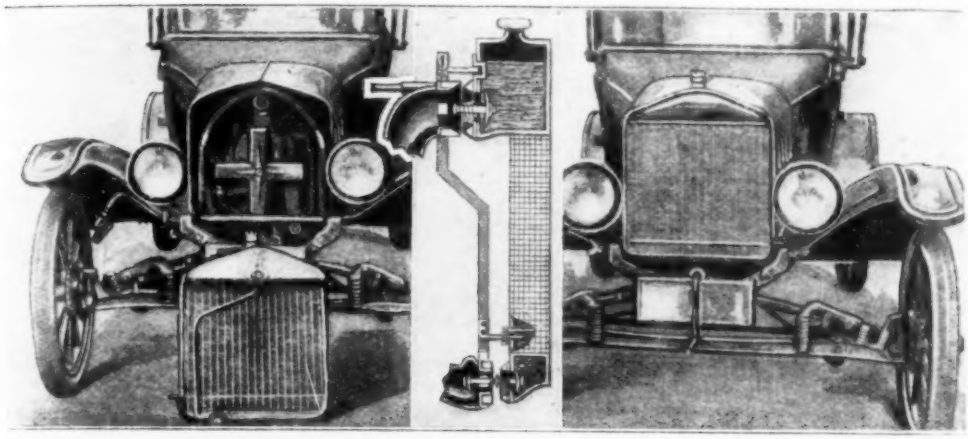
FINELY DIVIDED OXYGEN JETS OXIDIZE PARAFFIN READILY

A new process of direct oxidation of paraffin gives promise of producing fatty acids in large quantities and, at the same time, lowering the production costs; this for the reason that no catalyzing agent is necessary, very fine streams of oxygen being passed directly into the paraffin after the latter has been heated to 140° to 150° C. The resulting reaction further heats the oil to 200°, causing it to oxidize and distill. After about four or five hours, oxidation is completed. Besides the various forms of water and other soluble fatty acids, several by-products, among them volatile acids, alkali salts, and some alcohols are driven off in the process.

PENCIL POINTER FOR PASSERS-BY ON SIDEWALK

The latest innovation in public conveniences is the sidewalk pencil-sharpening stand. It not only offers the passer-by an opportunity to provide himself with a good point for his lead pencil, but serves as an attraction for the window display in front of which it is located. The sharpening machine is screwed to a cast-iron base of convenient height, and has a hinged cover of aluminum which may be locked over it for protection. The fittings are all decorative, to give as pleasing an appearance as possible to the useful little station.

¶Annually, for over 40 years, a flock of magnificent snow geese, each averaging 8 lb. in weight, has made Cape Tourmente, Canada, one of its regular stopping points on its northern migration. Close protection is having its effect, and this year the flock numbered over 5,000 members.



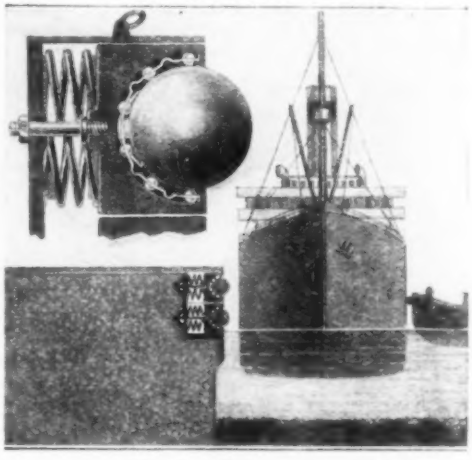
Left: Quick-Detachable Radiator Demounted. The Inverted U-Shaped Frame, Just inside the Hood, Forms the Support to Which the Radiator is Secured by Quick-Acting Bolts. Center: A Cross Section of the Device, Showing the Arrangement of the Internal Valves. Right: Radiator in Place

NOVEL MOUNTING MAKES AUTO RADIATOR QUICK-DETACHABLE

An improvement in the method of mounting automobile radiators can, so the inventor asserts, be applied to any make of car, or style of radiator, to render the latter quickly detachable from the chassis. Among the claims made for the device are that a radiator can be detached or applied in 24 seconds and that, during freezing weather, it can be taken off and carried indoors without need of draining. This is made possible by a special framework, to which the radiator is attached, and by an ingenious interior valve arrangement of both the radiator ports and the engine water-inlet pipe, which connects to the bottom of the radiator. When the radiator is removed, the valves seat, retaining the water. With the radiator in place, the valves are held open. As no auto thief would attempt to drive a radiatorless car, the device acts as a theft prevention.

DOCK OR WHARF SHIP FENDER THAT IS AUTOMATIC

To protect ships from the shock of impact with the sides of docks, or wharves, or with other ships, the old practice was to hang by hand from the ship's, or the dock's, deck fenders made of plaited rope, or hemp, so as to form a cushion at the danger point. A fender that requires no personal attention, and that may be permanently installed along the sides of docks, or wharves, is made of large hard balls, freely rotatable, on a series of small ball bearings housed in a socket, or container, that retains the large balls in place. Rows of these containers, with a heavy spring behind each of them, are installed in a strongly constructed casing framed into the dock side in such a manner that all blows on one or more of the balls are absorbed by the springs.

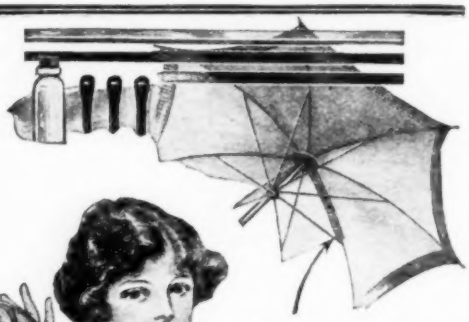


Inset at the Left, Is a Sectional View Showing the Housing of the Ball with the Springs behind It. Below, Two Fenders are Shown Installed in a Wharf

¶Two U. S. Marine Corps airplanes, manned by four officers of that body, recently completed a 4,842-mile air tour of Cuba and the Caribbean Sea islands in an actual air time of 46 hours 17 minutes, distributed over a total elapsed time of 24 days. No records were attempted, as the cruise partook more of the nature of a reliability run.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

After a Column of Sugar Cubes has been Exhausted through the Trap at the Bottom, a Fresh Supply is Placed over It. No Dirt Reaches the Sugar



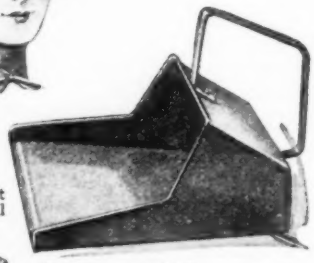
White Ink, Three Clips, and a Transparent Protecting Strip Which Covers a Black Strip of Writing Paper, Are the Requisites for Affixing One's Name and Address on the Inside of an Umbrella

Doctors Often Prescribe Compresses for Throat Ailments. The Makeshift Flannel and Cotton Rags Usually Wound about the Throat Are Unsightly. This Dainty Compress of Rubberized Fabric is Threaded through a Slit and Tied in the Front in a Becoming Bow

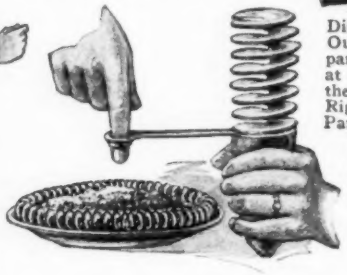
No Clamps are Needed When This Christmas Candle Holder is Used to Keep the Candle Upright

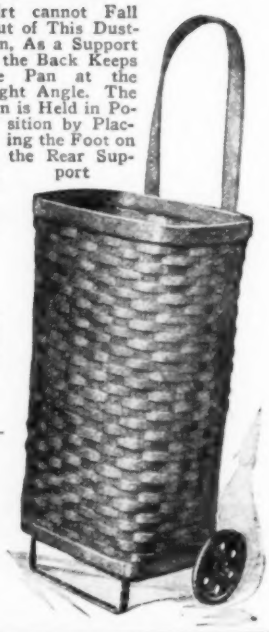
By Squeezing the Valve Neck, the Air is Permitted to Escape from these Water Wings. They are Made with a Single Air Chamber and are Tied about the Body of the Wearer with Cords

By Twisting the Screw End of the Potato Cutter into the Potato and Turning It with the Index Finger, Beautiful Potato Curls are Produced

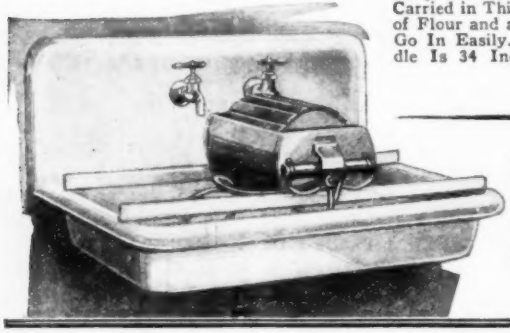


Dirt cannot Fall Out of This Dustpan, As a Support at the Back Keeps the Pan at the Right Angle. The Pan is Held in Position by Placing the Foot on the Rear Support



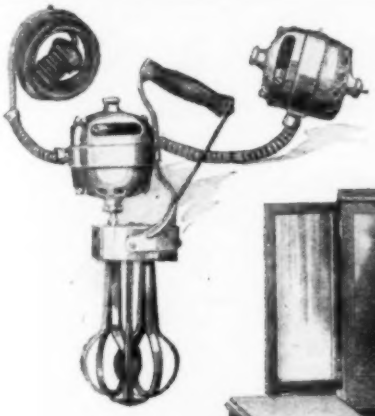


Fifty Pounds of Provisions may be Carried in This Basket Cart. A Sack of Flour and a Peck of Potatoes will Go In Easily. The Top of the Handle Is 34 Inches from the Ground



Water Power Operates This Tiny Washer. It Fits in the Kitchen Sink, Bathroom Tub, or Washbowl, and will Hold the Equivalent of Nine Towels

Anyone wishing further information on devices described in the editorial pages can



In Cleaning the Stirring Segments, the Motor of the Electric Egg Beater is Removed. The Speed of the Device may be Regulated to Suit the Different Requirements

Having an Abrasive Surface, the New Peeler Scrubs the Skin from the Potato. The Eyes are Plucked Out with the Peeler Point. There is Little of the Potato Wasted When This Peeler is Used

To Cover the Stand Lamp Shade While Dusting, This Durable Bag Is Practical and Long-Lasting

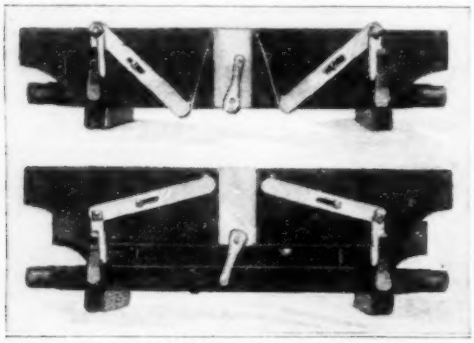
This Furniture Combination Comprises a Writing Desk, a Dressing and a Library Table. It is Built in Queen Anne, Mission, or Louis XIV Style, and in Mahogany, Walnut, or Oak, as Desired

An Ironing Combination of Such Size and Construction That It Fits Snugly in a Six-Inch Partition between the Wall Studding. Cabinet and the Boards are Delivered Ready for Installation

The Open End of the Mangle Permits Its Use in Ironing Ruffles and the Fullnesses in Garments. The Rolls are Brought Together by a Pedal

SIMPLE LEVER SYSTEM LIFTS DUMP-WAGON SIDEBOARDS

Lifting the sideboards of a 1-cu.-yd. dump wagon, loaded with 3,000 to 3,500 lb. of sand or gravel, is a man's-size job,

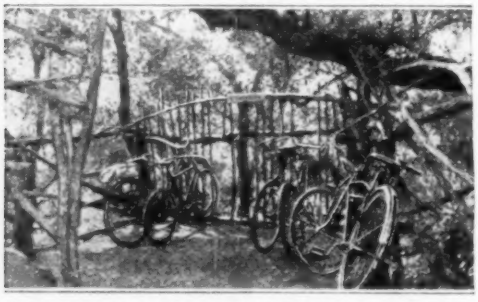


Above: Dump-Wagon Sideboard Levers Lowered. Sideboards in Closed Position. Below: Levers and Sideboards Raised Forming Openings for the Discharge of the Load

and many times two men are needed to do it. The inventor of a simple lever contrivance, which can be applied to any dump wagon, believes his device will greatly lighten the heavy labor. The apparatus consists of two long wooden levers, pivoted to the wagon stakes at their outer ends, and connected to a windlass by means of cables attached to their inner ends. Bolts, passing loosely through slightly off-center slots in the levers, connect them to the sideboards. As the windlass is turned, the cables are wound up, and lifting the inner ends of the levers, cause the sideboards to be raised through the medium of the sliding bolt.

RUSTIC BICYCLE RACK IS PARK CONVENIENCE

At the entrance of a western park, through which cycling is not permitted, is an attractively built bicycle rack, where



A Rustic Bicycle Rack, Where Visitors to a Western Park in Which Cycling is Not Permitted may Store Their Cycles, Combines Pleasingly with the Natural Surroundings

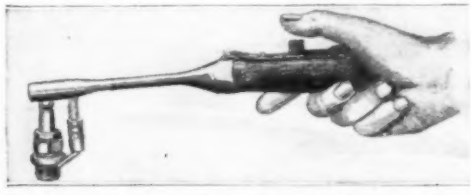
visitors may leave their wheels. Unlike similar stands, that are more or less out of keeping with their surroundings, the rustic effect obtained by using natural branches instead of finished lumber is quite pleasing, and harmonizes well with the natural landscape.

CLEANSING SHIP'S OIL TANKS WITH AIR INSTEAD OF STEAM

When a ship has been used as an oil tanker for some time, there accumulates inside the tanks quantities of poisonous gases. It is, of course, essential to remove these gases very thoroughly before men can go into the tanks to do any necessary repairs. An improvement on the old methods, where steam was used, which is often ineffective, is afforded by an apparatus that does the work with air. A long canvas tube is lowered into the tank, its bottom end being tightly connected to a nozzle-ended pipe conveying air under pressure. Near this point there are two holes in the canvas tube, and when the compressed air is turned on, it travels at a high rate of speed inside the tube, causing suction at these holes that draws the gases in with the flowing air, and carries them to the upper open end of the tube.

ANTISHOCK IGNITION TESTER FINDS FAULTY SPARK PLUGS

Disagreeable shocks can be avoided, when testing high-voltage automobile

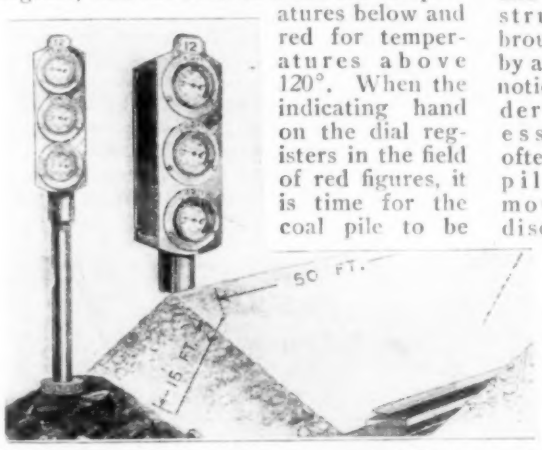


The Antishock Spark-Plug Tester in Service: Pressure on the Thumb Lever Forms a Gap over Which All or Part of the Spark Passes

ignition current, by using a simple device lately offered to the motoring public. It consists of a short shaft, divided into two circuits in such a way that the current may be led from the spark-plug terminal to an adjustable gap on the hardwood handle and back to the plug shell. This has the effect of diverting all, or part, of the current through the gap, where its strength and quality may be observed and judged. The handle makes a very high resistance insulation, and there are no metal parts in it with which the fingers are likely to come into accidental contact.

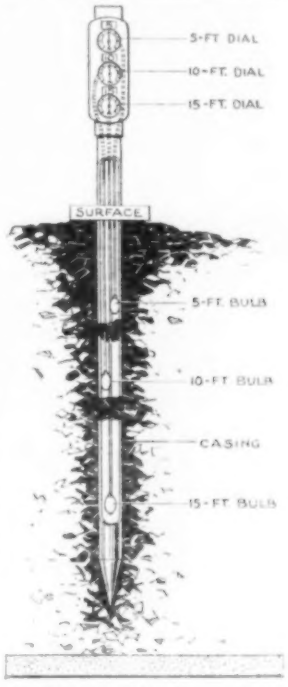
NOVEL THERMOMETER SHOWS HOT SPOTS IN COAL PILE

Spontaneous combustion often occurs in piles of coal that are seemingly inert and lifeless. Bituminous coal is particularly dangerous in this respect, and in order to avoid disastrous fires and save coal the temperature on the inside of the pile is carefully watched by the use of a novel thermometer. This thermometer consists of a long steel tube, pointed on one end for inserting it into the pile, in which three bulbs are incased at varying depths. They are all connected at the top to indicating dials which register the temperature at the depth of the corresponding bulbs. The dial is laid out in Fahrenheit degrees, and the scale is black for temperatures below and red for temperatures above 120°. When the indicating hand on the dial registers in the field of red figures, it is time for the coal pile to be moved for safety. The case holding the dials is built separately from the steel tube, and in the event of dangerous heat excesses, the assembly may be readily separated. When placed closely enough, and their warnings heeded, the thermometers are good insurance against the destructive agency of combustion in coal piles.



The Coal-Pile Thermometers are Placed at 50-Foot Intervals across a Pile. They Extend Downward in the Pile and Register the Temperature at Varying Depths

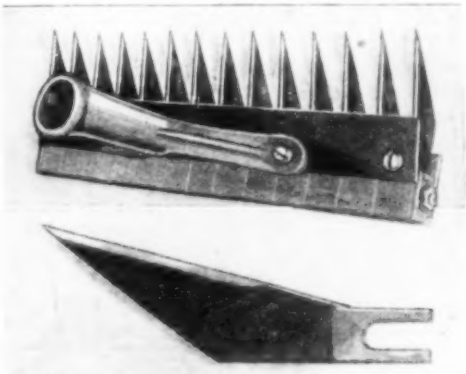
These combustion reactions are interesting and deceptive. In some cases no flames occur, and the destruction is brought about by a quiet, unnoticed smouldering process. Quite often, a huge pile, when moved, will disclose the startling fact that a large portion of it is only a mass of useless gray-white ashes.



A Diagrammatic View of the Thermometer Showing the Bulbs at Varying Depths and Their Connections to the Dials

BERMUDA-GRASS CUTTER RENOVATES LAWN

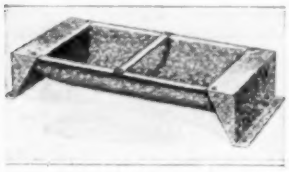
The removal of Bermuda, and other types of crawling grasses which tend to crowd out the more desirable kinds of grass, is a lengthy and laborious process. To facilitate it, a western landscape gardener has developed a suitable cutting device. It is made in the form of a rake, the teeth of which are removable and of sickle-bar design. These teeth are set at spaced intervals across the length of the rake head and are turned with their cutting edges forward. When operating the implement, the gardener jerks it toward him 3 to 6 in., thus cutting and pulling up the weed. He then slides the rake back to clear the knives. The teeth are spaced far enough apart to miss the lighter blades of the lawn grass and take only those spread out. This operation gives the other grass a fairer chance to thrive.



The Teeth of the Bermuda-Grass Cutter are Turned with Their Cutting Edges Forward

SECTIONAL HOG TROUGH IS EASILY CLEANED

A new sheet-metal hog trough, made in sections, is a good example of sanitary feeding devices. These troughs are made in sizes of two, four, six, and eight feet in length, without seams, and are taken apart by simply pulling the ends from the trough section. A brush and water applied, or a hose delivering a stream of water, will readily flush the trough bottom, after which the unit is reassembled.

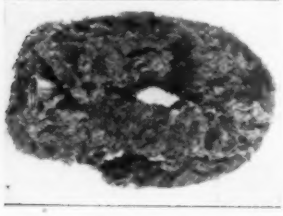


ATTACHMENT FOR PLIER JAW FITS IRREGULAR OBJECTS

To enable an ordinary pair of pliers to hold irregular objects firmly, a Minnesota inventor has designed an auxiliary jaw that may be attached to one of the plier jaws. The attachment, made of a single piece of metal, may either be pivoted on a pin through the jaw, or arranged to rock on its own curved contact face, so that it may adjust its position to the grasped article. The inner working face is channeled, or otherwise shaped, to fit bolt heads, spikes, or similar work. Attachments variously shaped for these purposes are interchangeable.

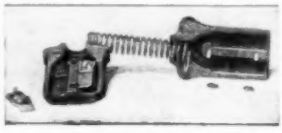
SPONGE NOZZLE WASHES AUTOS WITHOUT DAMAGING PAINT

An automobile-washing convenience, brought out by an eastern inventor, consists of a threaded fitting, designed to screw onto the one on a hose, and a loop of copper tubing, perforated with a number of holes, to which sponges are securely fastened. The ends of the loop of tubing are swaged into the threaded fitting, the whole serving to distribute the water to several of the sponges and thus keep them washed clean of the grit particles which, ordinarily, imbed themselves in a sponge body. It is claimed for the device that it materially shortens the time required to clean a car, thus saving water and labor, and that it prevents scratching of the paint. It also serves well in the washing of windows, or in any other cleaning operation where a sponge can be used to advantage.



NEW ATTACHMENT PLUG IS EASILY REPAIRED

A connection plug that is easily repaired and which will fit all appliances, such as heaters, toasters, irons, etc., is now in use. It consists of a divided shell, contact clips, and a spring. The shell may be removed by taking off two retaining nuts, and the contact clips are thereby exposed for repair. The clips are made with one flat side and one arcked side, which assures a positive contact with all forms of terminals.



THREE-WIRE ELECTRIC BULB GIVES TRIPLE SERVICE

Three independent filaments in a newly developed incandescent light bulb are claimed to prolong its serviceable life to a period three times as long as that of bulbs of the conventional type. Only one of the filaments is in service at a time. As each burns out, the next is switched into circuit by turning a simple, three-contact fitting on the top of the brass base. The filaments are of equal candlepower.

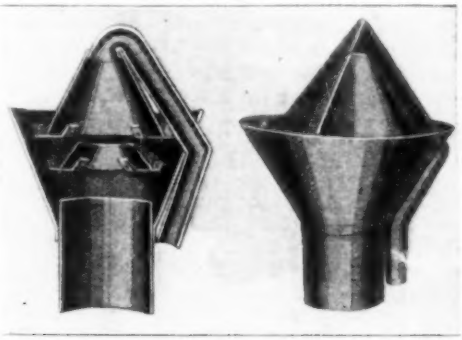
VACCINATION OF SUGAR CANE MAY MAKE IT DISEASE-PROOF

The vaccination, or inoculation, of plants in the bitterly waged fight against their diseases will appeal as a novel idea to many who have always thought of the method in connection with the prevention of human and animal maladies only. A measure of success has attended its use by the office of foreign seed and plant introduction, Washington, D. C., in the evolution of a variety of sugar cane which

will be immune to the commoner forms of disease, peculiar to the plant, and especially the so-called mosaic disease, which has recently made its appearance on the sugar plantations. Seedlings from the inoculated specimens will be tested for immunity, and if the experiment is the success it is hoped it will be, it is thought that a practically disease-proof variety of plant will be evolved.

SMOKESTACK SPARKS ARRESTED WITHOUT OBSTRUCTING DRAFT

In sawmills, and other plants where wood is used for fuel, the danger of sparks from the smokestack has to be guarded against with as little obstruction to the draft as possible. A new spark arrester was designed with this point in mind. Instead of anything in the nature of a screen, it has two circular baffles inside a flared stack top that overlaps the stack proper. One of these baffles slopes conically to a closed top, resembling an inverted funnel. What would correspond to the spout of the funnel is bent downward against the side of the stack. The

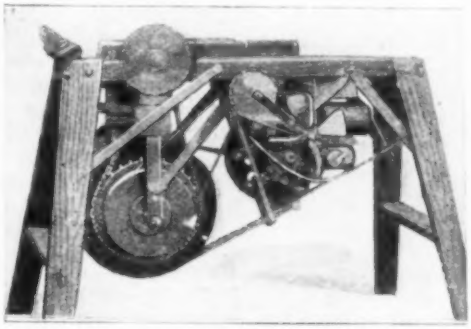


At the Left, the Spark Arrester is Shown in Section. The Spout for the Sparks is Seen Turned Down against the Side. The Right-Hand View Is an Elevation

draft carries the sparks down the inverted spout, from the end of which they may be conducted in any manner desired.

PORTABLE GAS-ENGINE POWER PLANT WEIGHS 48 POUNDS

Utilizing the air-cooled engine and a few other units of a discarded motorcycle, and devising some new and original parts, an ingenious Chicago mechanic has assembled a portable power plant which weighs but 48 lb. and can be packed in a large suitcase. However, for short trips it is merely turned upside down and wheeled along on a pair of casters with which it is equipped at one end. The power developed is sufficient to drive a fair-size circular saw through a 1½-in.



A Portable Power Plant Made Up Principally of Motorcycle Parts: It is Wheeled About on the Casters at the Left

board in a few seconds. By installing the proper wheels on the shaft of the contrivance, many odd jobs, such as polishing and buffing, and grinding knives, scissors, and the like, can be done.

STREAMLINED MOTOR-CAR TOP BUILT LIKE AIRPLANE WING

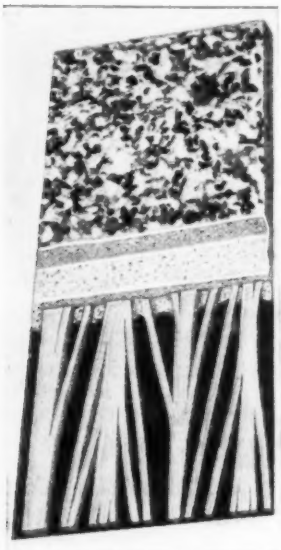
The influence of airplane-wing design is apparent in a new automobile top recently brought out by a Massachusetts inventor, which, so it is claimed, eliminates the objectionable back drafts caused by the conventional types of top. The new top is so shaped that it presents a modified streamline form to the atmosphere, somewhat on the order of the upper surface of an airplane wing. The effect is, that as it moves through the air, a partial vacuum is created above it, diverting most of the air over its top surface. The stray currents, sweeping in around the windshield, pass upward and along the under surface, passing out through two vents, one in the center of the top and the other just above the rear curtain, instead of curling back and down-

Owing to the Streamline Form of the New Top the Vacuum Created above It Diverts Most of the Draft. Stray Currents Pass Out through the Vents

ward, chilling the passengers' necks and shoulders.

EXPANDED WOODEN LATHING COMPETITOR OF METAL KIND

A novel form of wooden lathing, recently introduced to the building trades, is made on the order of the expanded-metal variety, in that the 4 to 8-ft. lengths are split and pulled out sidewise so that what would ordinarily be a narrow strip, is expanded to a width of 9 to 18 in. The splitting is not done in a haphazard manner but strictly according to the nature and grain of the Douglas-fir timber used. Among the claims made for the new lath is the obvious one that it will cover more space than the older form. It is further claimed that it will not corrode or warp, and that, as the split sections are quite small, the plaster completely encircles them, making them fireproof to a large extent. No paper or other backing is required with the improved lath, it being applied directly to the studding.



KEY-RING AUTO TOOL SERVES NUMBER OF PURPOSES

A handy little article of equipment offered to the motorist, is a combination spark-plug cleaner, igniter breaker-point file, and adjustment gauge. It is made of hardened steel with a long narrow point, with which it is possible to reach all parts between the spark-plug shell and insulator to dislodge the carbon formation. Ground to varying thicknesses from top to bottom, it serves as a thickness gauge with which accurately to adjust the gap between spark-plug electrodes and also that between the igniter breaker points. An eye at the top permits stringing the little tool on a key ring.

This Key-Ring Auto Tool, besides Cleaning Spark Plugs and Adjusting Their Gaps, Files, Igniter Breaker Points and Accurately Gauges Their Distance Apart

DETACHABLE SCRAPER BLADES OF SPECIAL STEEL

The ordinary hand scraper, such as is used in every machine shop for scraping bearings and similar work, is seldom made of high-grade steel. It will, therefore, be good news to machinists that now there are on the market detachable scraper blades made of special steel, that will take an extra-fine edge and keep it longer than any ordinary steel. The blade is the width of an ordinary scraper, a few inches long, and only 1/16 in. thick. It is fastened to the scraper body by a clip, which holds it positively in place and automatically tightens its hold on the blade when pressure is applied to it during operation.

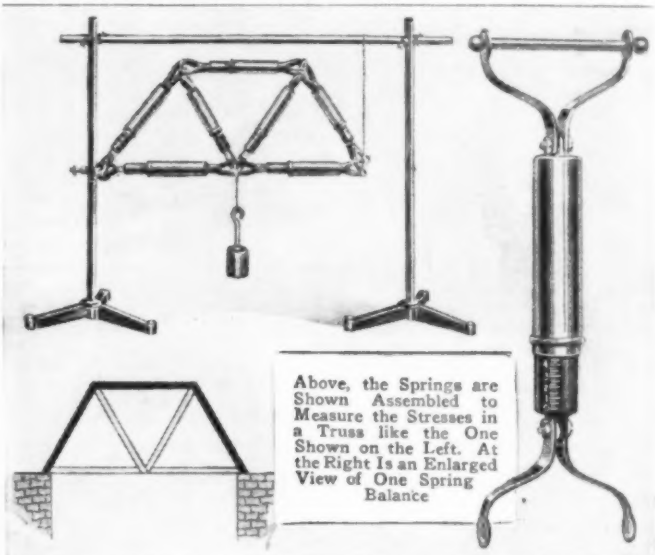
The Tool is Shown with the Detachable Blade Clamped in Place. Obviously the Blade can be Attached to Any Tool that the Clamp will Fit

NEW VULCANIZING PROCESS WITH FUSIBLE METALS

If rubber can be molded without the use of molds there must be an economy in the process of manufacture. If, besides, the process eliminates any necessity for the use of steam, as in present practice, which is known to be deleterious to the rubber itself, there must be an improvement of the product. Both these conditions are carried out in a new method of vulcanizing rubber by the use of fusible metal alloys, that melt at a temperature slightly above the degree of heat necessary to effect vulcanization. When the metal has been liquefied, in a suitable receptacle, the article to be vulcanized is immersed in it. Its temperature is then allowed to fall to the degree necessary for effective vulcanization, and is maintained at that temperature long enough to complete the process. The metal is then allowed to cool and solidify. In the process of cooling it shrinks, and thus compresses the rubber and obviates porosity. Finally the article is removed from the metal by heating it till it is soft enough to be easily disrupted.

INSTRUMENT THAT RECORDS STRUCTURAL STRESSES

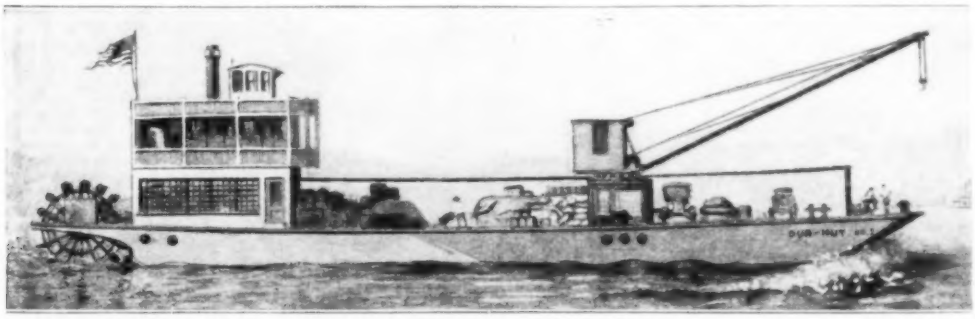
The stresses in the various members of any structural system may be experimentally ascertained by the use of a truss unit, which consists of a spring balance that reads up to 15 lb., either in tension or compression. A number of these units can be connected together so as to form a truss of any kind, a girder, a roof frame, or a derrick, and these can be loaded by hanging weights to them. Each truss unit will then record the amount of the stress, either tension or compression, in each member of the structure. The amounts are proportionate to the known weight of the load, and form a basis of calculation for any load, no matter how great. Stands are furnished to provide supports of the nature usual with the structure represented.



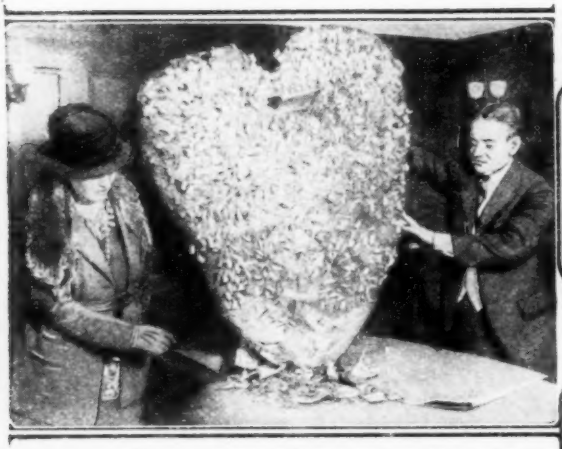
Above, the Springs are Shown Assembled to Measure the Stresses in a Truss like the One Shown on the Left. At the Right Is an Enlarged View of One Spring Balance

OHIO RIVER BOAT CAN ADJUST ITS STERN PADDLE WHEEL

A stern paddle-wheel boat, which has some novel features, is being constructed for use on the Ohio River. The objects aimed at are a simplification of the power plant so that an inexperienced man can run it, combined with an economy of engine-room space, so as to increase the cargo capacity to a maximum; and, in the designs for carrying out these objects, the most interesting of the novel features evolved is the means of driving and adjusting the paddle wheel. The main power plant consists of a semi-Diesel oil engine, direct-connected to a generator, which furnishes current to two motors that are installed outside the boat at the stern, and which drive the paddle wheel, on either side of which they are boxed in on a bracket support extending from the stern of the vessel. This support is vertically adjustable by means of a wheel, located suitably for operation by the engineer, who thus raises or lowers the paddle wheel to suit the draft of the boat, as it varies with the amount of the cargo carried. The wheel is locked in position after such adjustment, and is then in the position for propelling the boat to best advantage.

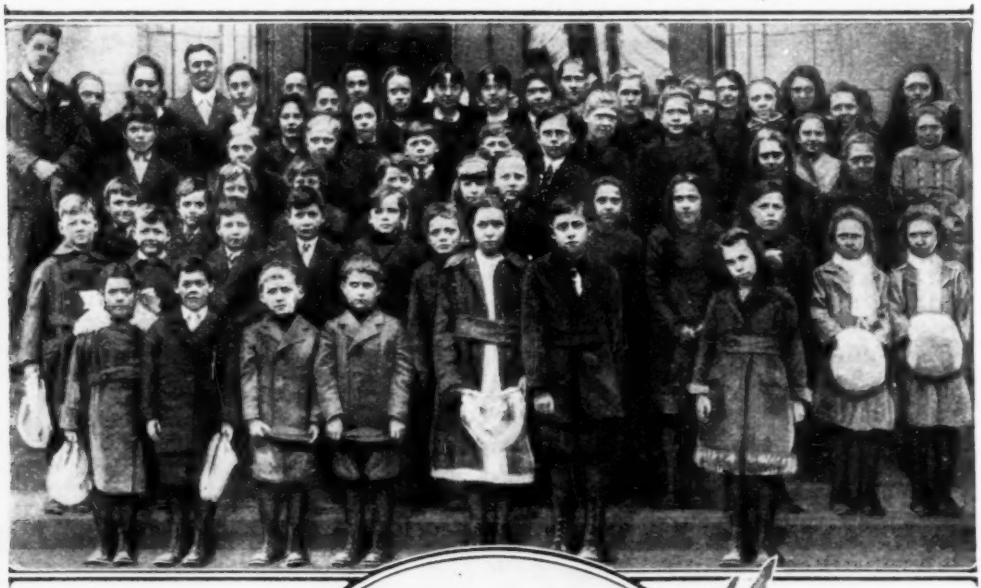


The Boat is Seen Afloat on the Ohio River. Beside the Paddle Wheel at the Stern is Seen, Supported on a Bracket, One of the Boxes That Contains a Motor and the Adjusting Apparatus. There Is a Similar Box on the Other Side

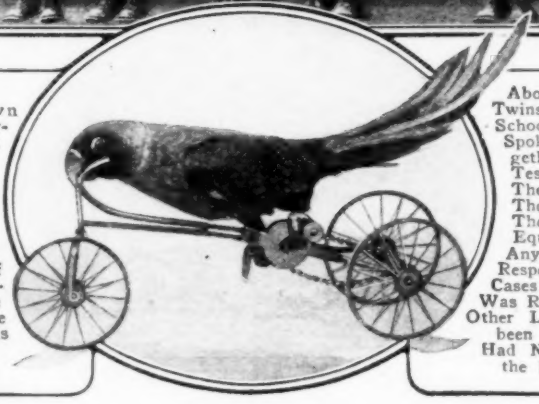


Mrs. Herbert Hoover and Mr. W. B. Sheppard are Opening the "Heart of Gold," So-Called Because It was Used to Collect Hundreds of Individual Gifts from a Penny to a $100 Check for the Child-Feeding Fund of the European Relief Council. When Opened, It was Found to Contain $57,000

The Interest of the Owners of the Hands and Feet Shown in the Picture has been Attracted by the Octopus, a Small One, That has been Left on the Beach by an Ebbing Sea Tide

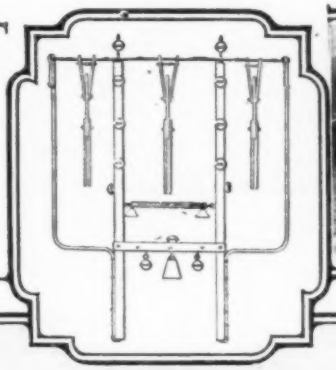


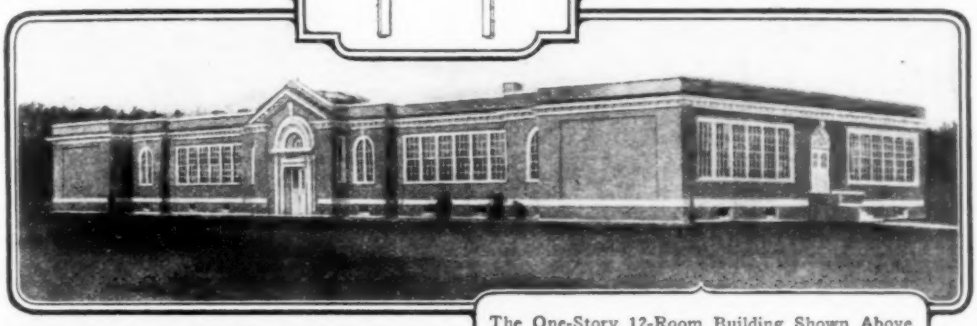
At the Right is Shown One of the Trained Parrots with an American Show Exhibiting in India. The Company Has Several of These Feathered Actors, Who Do All Kinds of Acrobatic Stunts. This One is Riding and Steering a Tricycle. At the City of Rawalpindi They Performed before the Duke of Connaught When He Visited There, during His Recent Tour of India



Above Are 30 Pairs of Twins from the Public Schools of the City of Spokane, Gathered Together to be Put through Tests for Determining Their Mental Efficiency. The Tests Proved That They Were Quite the Equals in Intelligence of Any Children of Their Respective Ages. In Three Cases One of the Twins Was Right-Handed and the Other Left-Handed. It has been Found That This Had Nothing to Do with the Sex of the Twins

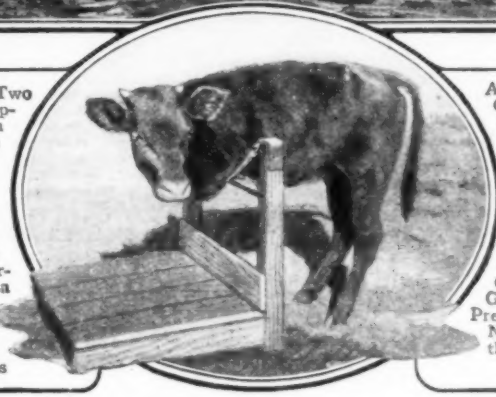
To the Right Is a Plan of a New Patent Toy That Combines Acrobatic Stunts with a Musical Accompaniment. Three Trapeze Performers are Hung from the Cord That Stretches across the Top. Pressure on the Handle Causes the Acrobats to Perform, and at the Same Time Rings the Numerous Bells on the Toy. Farther to the Right a Boy is Shown Operating the Toy





The One-Story 12-Room Building Shown Above Is a Public School in the Town of Newfield, New Jersey, That was Built in This Way So as to Cover as Much as Possible of the 30-Acre Site That was Bequeathed to the School Authorities for This Purpose

A Quadruped with Only Two Legs Is Far More Helpless Than a Biped with Only One Leg. The Owner of the Calf, Pictured to the Right, Which Has No Forelegs, has had to Construct for It a Special Feeding Trough That Supports Its Body While Feeding. The Calf Is Perfectly Healthy, Has a Splendid Appetite, and has Developed Considerable Skill in Hopping from Point to Point by Rising on Its Hind Legs



Above is Seen a Class of Children Going through the "Swan Exercise," Which Is a Means of Physical Training That has been Developed by the Government Swimming Director in the Canal Zone. This Same Class has Performed before President Harding, General Pershing, and Other Notables. Sons of General Pershing, of the President of Panama, and Nieces of the Governor of the Canal Zone have Attended This Class

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

CAPTIVITY MODIFIES BONE STRUCTURE OF LION'S SKULL

Lions raised in captivity have marked differences in the size and form of the skull, according to the superintendent of the Washington Zoölogical Park. In lions raised in zoos the skulls are broader and shorter than where they develop wild in their native jungle. The lion is naturally accustomed to secure food by fastening its large upper teeth in animals and dragging them down with its weight. The force thus exerted on the bones appears to be the reason for their greater length in the wild animal. Also, it is found that in the lions raised in captivity certain bones of the arch of the palate have circular cross sections instead of elliptical, as in the native lion. The elliptical form is best adapted for strength. This further shows that the use of the bones of the head to carry the weight of the lion in dragging down its prey has modified their structure better to accommodate the forces acting upon them. The character and amount of mastication is about the same in both kinds of lions, and the corresponding portions of the skull have no important differences.

This information has been verified by comparing the skulls of many wild lions with those of lions captured in the same locality and raised in captivity from cubs.

In regard to the development of intelligence, it is at first assumed by many people without second thought that animals raised in captivity should reach the highest development. This is not indicated by the skulls. On the average, the brain case of a wild lion has 30 cu. cm. more space than that of the cage-bred animal. The wild one has to think and plan for his dinner, and requires more brains; and nature provides the extra space.

These striking differences in the skulls might cause some person examining them, not acquainted with the facts, to conclude that one was the ancestor of the other, and that several million years of development separated the two types.

*

X-RAY WORK FACILITATED BY BUBBLES

How would you like to be sick, and be opened up by a surgeon, only to find that he had guessed wrong? It is very difficult in many cases of sickness to tell what is wrong, and the X-ray has naturally been an important aid in determining the nature of various troubles. Recently an odd method has been developed which increases very much the efficiency of the X-ray in making certain examinations of the body.

A quantity of air, oxygen, or carbon dioxide, is introduced into the abdomen between the organs by means of a hollow needle. This produces a sort of bubble which can be passed from point to point by placing the patient in different positions. If his body is placed upright it rises to the top, or in other words certain of the organs drop away from the diaphragm. If he lies on his stomach, supported on his chest and thighs, the bubble takes a position up against the backbone.

It is found that if certain growths are present, or things are not right, this fact will be disclosed, together with important particulars, by the X-ray photograph taken of the corresponding region.

Air, oxygen, or carbon dioxide will be absorbed by the body from such a bubble in a few days, and according to one practitioner air is entirely satisfactory. After such an examination, he manipulates the patient and removes most of the air. The remainder generally gives the patient no inconvenience and disappears in a few days.

*

STRANGE FOOD HABITS OF ANTS

In the tropics there is a variety of red ants which are a destructive pest, but have interesting habits. These ants collect the leaves from the orange trees, usually at night, sometimes completely stripping the branches. The leaves are not eaten, but are taken to the nest, where they are masticated, forming a paste. On the pulp thus formed a fungous growth is cultivated, and this fungus forms the solid food of the ants. The leaves are harvested by the larger members of the nest, are chewed by the smaller members, perhaps helped by the larger ones, and the smallest ants tend to the resulting crop and act as gardeners and nurses. There is a more or less marked division of labor.

Each ant colony arises from a single queen. The food problem is solved by the queen, when she issues from the parent nest to form a new colony, taking some of the fungus beneath her tongue, where it is retained until egg-laying time. The first eggs laid are crushed by the queen, who then sows the resulting mash with the fungus stored beneath her tongue. In this manner the food supply for the new establishment is started.

This variety of ant is an obnoxious pest, being one of the most destructive ants known. At one time there was a reward of $30,000 offered in Brazil for a method of exterminating them.

*

WIRELESS WAVES DO NOT LEAN OVER

Do the wireless waves lean forward in the direction in which they are traveling, or lean back, or what? This is a question of great importance to the theory of radio transmission, and is of practical interest in the reception of signals by ground antenna. From a study of the question by experts of the Navy Department, with a new form of receiving system, it appears that for waves of 10,000 meters and over, at least, the deviation of the wave front from the vertical does not exceed three degrees. Also, it was determined that the wave fronts from "static" were vertical like those of the signals. This is contrary to the idea that has been held by many that static comes from above.

*

THE EARTH MAY LEAVE THE SUN

Is the earth going to fall into the sun? If so, how soon? These questions have not only engaged the attention of scientific men, but have interested many of us as well. Astronomers have studied the questions but where more than two bodies are concerned it has not yet been possible to determine the exact events which will happen to astronomical bodies moving under the influence of their mutual attractions.

Recent progress has been made in the mathematical study of this very difficult subject, and, at a recent Washington meeting, interesting statements were made. The results indicate that, for a group of objects, there might be a tendency not for them to come together, but to separate. We may not tend to fall into the sun so much as to leave it. Certain general conditions, which have been determined, suggest that a number of planetary bodies will tend to break into groups that will move apart. These groups may likewise tend to subdivide, further accentuating the scattering.

This fact may explain why the stars have not all collected at one point in space. Further mathematical work is needed, however, before the exact nature and significance of the phenomenon can be determined.

*

BABIES' TEETH SOMETIMES SLOW BUT ALWAYS SURE

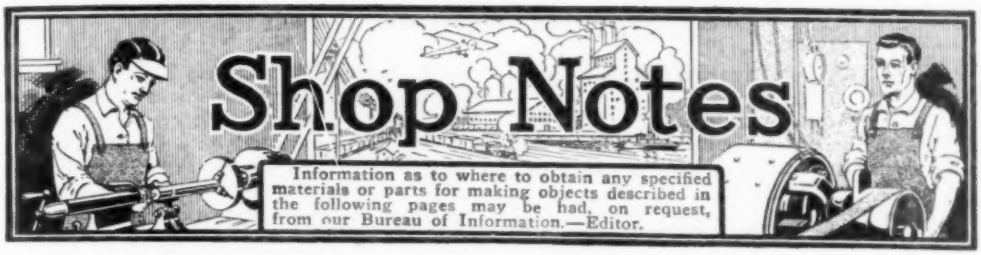
Every year about a million or so mothers in the United States worry about the baby's teeth being slow in coming. This anxiety is based on an unconscious fear that the child will not get any teeth at all. Practically none of them, however, ever heard of a baby failing ultimately to get its teeth.

According to a scientist of international standing, while cases are known where the teeth never appeared, such instances are remarkable for their rarity. As a rule, such cases are known to those making a specialty of such subjects only through literature, and unusual indeed is it for a case to come to their personal knowledge.

*

CHANGE IN SEA LEVEL

According to the studies of one scientist, it appears that at various points on the earth there are indications that the level of the ocean has dropped about 20 ft. in recent geological times. The evidence is said to be too widespread to be accounted for by local disturbances, and it is suggested that this lowering of the level of the sea may have been caused by water taken to form the polar ice caps since the last warm interval.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Handy Log Band Saw

By GEO. G. McVICKER

THE well-known buzz saw is hard to improve upon for working up poles or similar timber that can be easily handled, but where heavy logs are met with, and especially if help is not available, the splitting of larger ones demands much labor before they can be worked.

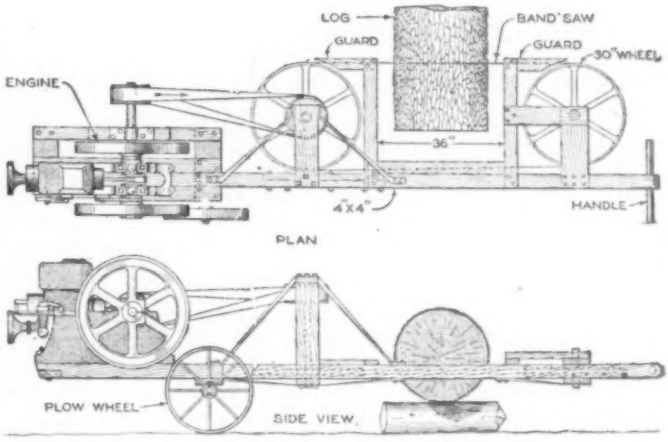
The quickest-acting saw that can be used for these heavy pieces is one built along the lines of that shown in the drawing, driven by any small engine up to 3 hp. The blade of the saw should be at least 1½ in. wide, and 2 in. would be better if an engine larger than 2 hp. is used. The beam is made of 4 by 4-in. stock, 14 ft. long. Any flat-faced wheels, from 30 to 36 in. in diameter, may be used after they are properly centered and keyed to shafts. The posts, or arms, for holding these shafts may be of wood or metal, the outer one being adjustable so as to take up slack in the saw. The carrying wheels should be mounted so that the complete outfit will be slightly heavier on the saw end, thus making the handling of the outfit easy, because the saw is fed by pressing down on the wheel. The guards about the wheels may be made of 1 by 1½-in. angle iron, if this is available, as it gives greater rigidity and two-side protection.

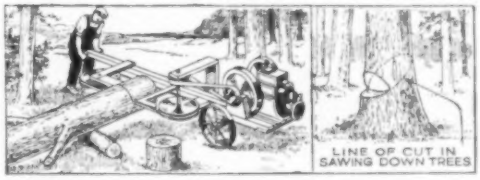
The brace supporting the wheel nearest the engine may be made adjustable to tighten the belt, and a guard should be provided on the back of the saw to prevent sawed-off chunks from falling on the band and causing it to bind.

To use the saw, the log should be placed on a jack, or small log, so that it can be cut all the way through, otherwise the end of the frame would strike the ground before the cut is completed. Trees may be cut down with this outfit by cutting at an angle of about 45 degrees.

There are no important dimensions to be adhered to, the only necessary cautions being to get the pulley on the saw shaft in line with the engine pulley, so that the quarter-turn belt will operate properly, and to get the two saw wheels in line with each other.

An outfit of this kind is somewhat cheaper than a power drag saw, although its capacity is more limited; it works faster, time is saved in moving the machine from one cut to another, and the saws are not expensive.



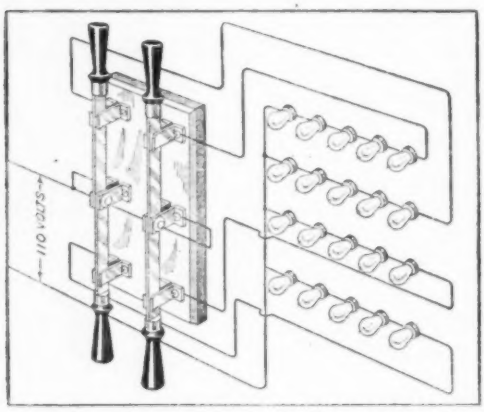


Felling Trees and Cutting Up Logs is Easily and Quickly Accomplished in a Minimum of Time by One Man Using a Portable Power Band Saw Driven by a Two or Three-Horsepower Farm Engine

¶Dull broaches may be greatly improved by sharpening with an oilstone.

A Selective Switch

The selective switch shown in the drawing fills the need of a means of controlling four separate banks of lights in such a



An Ordinary Double-Pole Double-Throw Switch Converted to Control Four Separate Circuits, Any or All of Which can be Opened or Closed at the Same Time

manner that any combination of circuits up to the whole four may be switched on as desired.

The switch is made from an ordinary double-pole double-throw switch. The fiber bar holding the switch blades together is removed, and two similar blades are provided, so that the four blades move on the central pivots and each blade makes contact with but one clip. Four insulated handles are procured, and the arrangement connected to the various circuits as indicated. Note that one wire from the current-supply line runs to both middle contacts, and the other to one end of each of the light banks. A switch of this type can also be used to advantage for fixed or variable condensers in radio work, by substituting condenser units for the lamp banks.—A. D. Keogh, Springfield, Ohio.

Crankcase Drainings Used as Fuel

In the fall of the year most garages have on hand a considerable quantity of old oil, drained from the crankcases of cars left for storage. In some instances it is possible to dispose of this oil for various purposes, but in many more it represents an absolute waste.

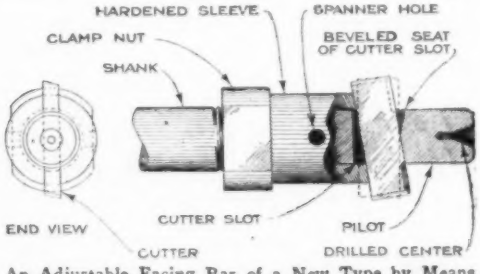
To utilize this oil, an enterprising Texas garage proprietor used it as fuel to furnish heat during the chilly weather that is not entirely unknown there. He installed a 50-gal. barrel on brackets, at an elevation above the stove, and, drilling a hole near the bottom of the barrel, fitted a piece of ¼-in. pipe leading to a cut-off valve near the stove. The burner that was connected to the pipe consisted of a piece of ¼-in. pipe having one end plugged, and drilled with a series of small holes, ½ in. apart, on the underside to permit the oil to drip through.

A few fire brick were placed inside the stove, and the fire was started by inserting lighted shavings or some paper, and turning on the oil, the flow of which was regulated by the valve in the line.—Ralph Odiorne, Eagle Pass, Tex.

An Adjustable Facing Bar

When facing by means of a cutter bar held in a slotted shank, if the cutter is not exactly square with the shank, the face on the work will be more or less convex. With the ordinary form of cutter, held in the bar by means of a setscrew through the outer end, the farther side of the cutter is clamped against the end of the slot, and even if, at first, the end is square, it will soon wear out of true, and unless the opposite edge of the cutter is parallel with the edge bearing against the slot, the work will still be convex.

The drawing shows an adjustable bar in which the cutter bears against an eccentric sleeve, and no setscrew through the end is needed, so that this end may be center-drilled and the device used as a boring bar between centers, if desired. A portion of the bar above the slot is threaded for a nut, and then a hardened-steel sleeve, which should be a snug fit over the bar, is slipped on. The forward end of this sleeve is slightly beveled, as shown in exaggerated form in the drawing, and holes are drilled in it for an adjusting spanner. The forward end of the cutter slot is slightly beveled both ways



An Adjustable Facing Bar of a New Type by Means of Which the Cutter is Held Square with the Shank, Making It Possible to Produce a Perfectly Plane Surface on the Work

from the center, so that the cutter rocks thereon. By rotating the sleeve, the cutter will be rocked back and forth and may

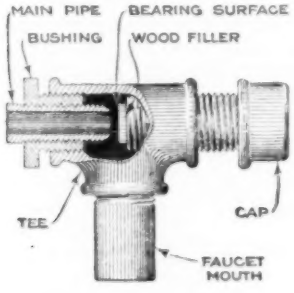
be set square with the bar, and, when the nut is tightened up, it will be securely held. It is realized that the sleeve will not bear squarely across the edge of the cutter, but if the latter fits the sides of the slot accurately and without play, this will not matter, especially as a cutter of this type is aways comparatively narrow.—H. H. Parker, Oakland, Calif.

Heating Wiping Solder and Babbitt

Do not heat wiping solder too much, as this will burn out the tin. Take a stick of white pine, whittle the end clean, and dip into the solder pot while the metal is heating. When the stick chars, or blackens, in about five seconds, the solder is sufficiently heated. If it chars immediately, there is too much heat. This is also a good test when melting babbitt for bearings.

An Emergency Faucet

The serviceable and substantial faucet shown in the drawing, made of pipe fittings, was installed on a 1-in. line when it was not possible to obtain a faucet of the regulation type on short notice.

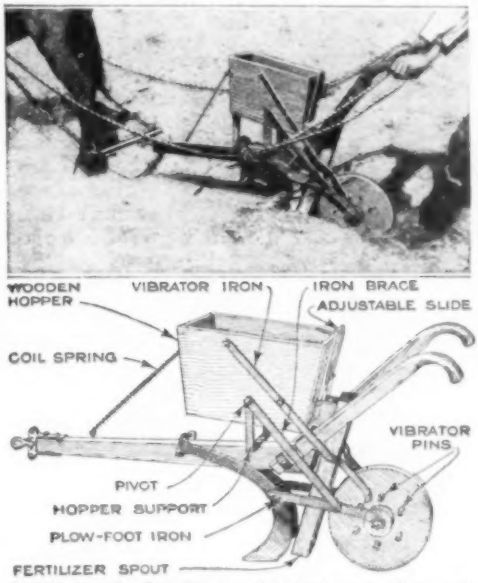


A 1¼-in. tee is required for the body, and the thread on the pipe should be cut back, and a 1 by 1½-in. bushing screwed on, so that about ½-in. of the pipe projects. The thread of the projecting pipe end is filed square across, and then beveled to a sharp edge. The tee is screwed onto the bushing with the side outlet downward. A nipple, or short piece of threaded pipe that will screw easily into the tee to meet the projecting end of the pipe, is provided. The inner end of this nipple is filed off square, and a hardwood plug is driven in tightly and allowed to project a little. Saw or file the end of the wooden plug square and smooth. The open end of the nipple is closed with a cap, or with an elbow having a short length of pipe screwed into it for a handle.

When the improvised valve is screwed down tightly and rests upon the end of the supply pipe, it completely shuts off the flow of water.—B. F. Dashiell, Dunkirk, Md.

A Homemade Fertilizer Distributor

For distributing commercial fertilizer in rows before the planting of crops, the homemade distributor shown in the drawing, as attached to an ordinary plowstock, has manifest advantage over the usual hand method.



A Homemade Distributor, Attached to a Plowstock for Spreading Fertilizer in Rows Saves Time, Labor, and Fertilizer

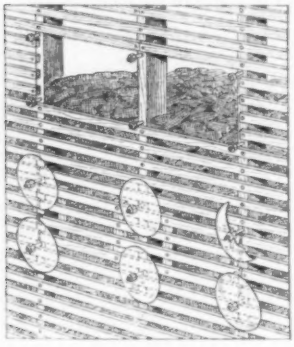
A wooden box hopper for carrying the fertilizer is pivoted in a U-shaped support; the vibrator irons are fastened to the sides of the box at an angle and engage with the vibrator pins. The disk in which the vibrator pins are inserted is 12 in. in diameter, and is attached to the plowstock in the manner indicated, by iron straps.

A small square hole is cut in the bottom of the rear end of the hopper as an outlet for the fertilizer, which is guided into the furrow by a small stationary trough made of tin. The size of the opening in the hopper is controlled by a thin piece of board that slides up and down and is held in place with a thumbnut and screw. A stiff coil spring is provided and attached to the hopper and plowstock, in the position shown, so as to bring the hopper back to the level position after it has been tipped up by the vibrator irons when they make contact with the pins.—L. M. Jordan, Wallace, Ala.

¶To make a dull glass cutter work, dip the cutting disk in turpentine.

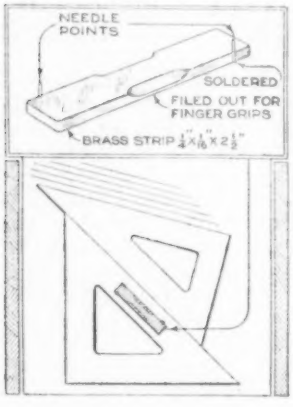
To Hold Corncrib Doors in Place

Most corncribs are built with detachable sections that are removed to provide a low opening, through which the corn is scooped until the crib is nearly filled. A satisfactory method of holding these sections in place is to put disks from an old harrow over the corners of the sections and secure them with bolts. This method is simple, as but little time is required to remove or replace the sections, and they are held firmly and without injury to the lumber.—S. E. Gibbs, Ames, Ia.



An Aid in Drawing Angular Lines

In drawing parallel lines at an angle to the horizontal, and in other applications where one triangle must be held rigidly in place while another is slid along it, it is often very fatiguing to hold it, and difficult to keep it from slipping. This is especially true when large numbers of lines are to be drawn in this way.



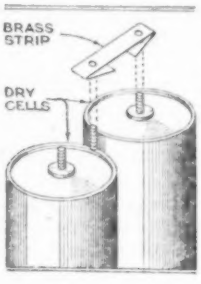
A little device which holds the triangle firmly in place on the board has proved to be a great convenience, and to eliminate slipping completely.

A brass strip, ¼ in. wide, 1/16 in. thick, and about 2½ in. long, was cut, and near two diagonally opposite corners small notches were filed in the sides, needle points being soldered into the notches as shown in the sketch; the needles were allowed to project a little over ⅛ in. Ordinary sewing needles were used, and to facilitate handling while soldering, they were not cut off until they had been soldered in place. After filing off the surplus solder, and filing finger grips in the center of the strip at each edge on the bottom, as shown, the device was ready.

Two small holes were drilled along the hypotenuse of the triangle, coinciding with the position of the needle points. The strip is placed on top of the triangle, with the points inserted into the holes, and a slight pressure pins the triangle firmly to the paper in any desired position.—D. H. Palmeter, Detroit, Mich.

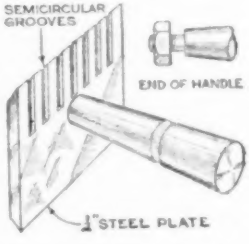
Spring Connectors for Dry Cells

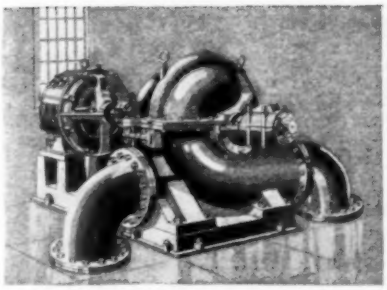
A dry-cell connector, especially useful for batteries that are often removed or renewed, is made from a strip of thin spring brass, about ½ in. wide. A short length at each end of the strip is bent back, as indicated, and holes are punched through both thicknesses, about ¾-in. apart. The bent portions are then sprung open slightly and placed over the binding posts of the cells, from which the nuts have been removed. Such a connector will have a high current capacity and low contact resistance, and will hold without fail, unless the battery is subjected to a great deal of vibration.—Curtis Ralston, Springfield, Ohio.



A Belt-Joint Scraper

A tool for scraping and preparing the surfaces of the spliced ends of endless leather belts departs from the usual straight-edged scraper in that it has teeth on one edge. The toothed edge serves a double purpose; it removes the old cement and glue from the surface better than a straight scraper, and after the surface has been scraped down smooth with the straight edge, the toothed edge is used to roughen the leather and make a better surface for cementing. A shoulder is turned on the end of the metal handle, and the blade is held in place by a nut. —M. E. Duggan, Kenosha, Wis.





PUMP TROUBLES

By A. P. Blackstead and G. R. Hardis

[Proper design and erection of intake screens, and periodical inspection of pumping units for obstructions, are matters not always given their due share of attention. Several instances of trouble encountered in pumping plants, and traced to faulty screening, or lack of inspection, are given in this article, which, although complete in itself, will be more appreciated in conjunction with the two previous articles, published in May and June.—Editor.]

FOREIGN obstacles, lodged in or passing through the waterways of centrifugal pumps, constitute one of the most serious drawbacks to successful operation. Very frequently, dangerous and costly injury to the internal parts of the pump results when solids are drawn in through the suction, and are struck at high velocity by the vane tips at the impeller entrance, A, Fig. 1; or in passing through the impeller, attain a high momentum, and upon leaving the revolving wheel, impinge against the diffusion-vane tips, C, in pumps that are fitted with diffusers. When such a shock occurs, the vane tips at the entrance and exit may be badly battered, diffusion tips become distorted and the angularity destroyed, pump or driving-medium shaft broken or badly sprung, coupling connections sheared, thrust and steady bearings seriously injured, or the pump otherwise disabled.

Often objects of such size and shape are admitted to the impeller eye that they will not clear the water passages, and become tightly jammed at B, through the centrifugal force exerted by the impeller wheel. This causes a reduction in capacity and a loss in efficiency that may not be detected for an indefinite period of time. Where Venturi or flow meters, or other means of easily checking the quantity discharged are available, such reduction can readily be observed. On the other hand, the lack of such devices may result in inefficient operation over an extended period.

A striking example of clogging became manifest in a pumping station at a large Pennsylvania steel plant, on the Ohio River. In this plant two vertical-shaft pumps, without diffusion vanes, were in service, driven by electric motors. The pump pit was between 40 and 50 ft. deep, from the motor floor to the pump level; so constructed as to eliminate excessive suction lift at low water in the river. The suction intake was screened by bar screens, made of ¼ by 2-in. steel flats, spaced with about 1½-in. clear opening between. The two pumps were alike, both rated at 16,000,000-gal. daily capacity, but, on account of a gradual falling off in output, the steel company sent out a call for assistance.

It had so happened, without particular reason, that pump No. 1 had been run for over a month, whenever there was need of pumping, without No. 2 having been used. On the day investigation began, unit No. 1 was discharging at the rate of 12,000,000 gal., as shown by the Venturimeter indicator. The steel-plant master mechanic attributed the reduction to excessive clearance in the wearing rings, due to the fact that some sand and silt was carried in suspension with the raw water. This was natural to expect, and was per-

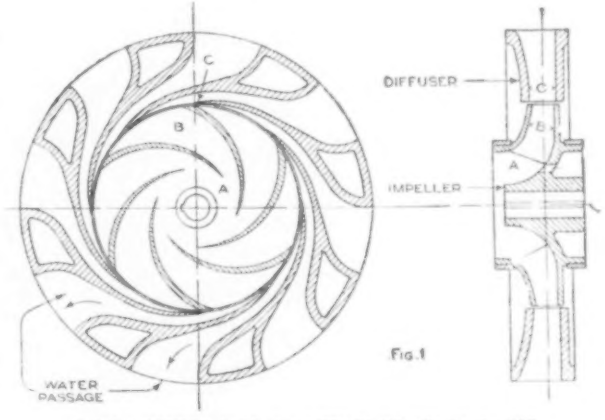


Fig. 1

TYPICAL SECTION THROUGH IMPELLER AND DIFFUSER VANES

This Illustration Shows the Points in Impeller and Diffusion Vanes Where Obstructions Are Most Likely to Lodge, Reducing the Capacity of the Pump

fectly good reasoning, but when the pump man made the suggestion of possible clogging, it was received with ridicule. How was it possible for the pump to become obstructed with the screens protecting the intake?

Unit No. 1 was stopped and No. 2 thrown into service. The Venturi-meter dial showed a 3,000,000-gal. daily rate, and no more. Instantly the suggestion of clogging gained considerable weight, for the last previous run recorded for No. 2 had shown a capacity far above this figure.

The pump well was flooded at the time, and the pumps were submerged, owing to high water in the river, but a small sump pump afforded a means of unwatering the pit so that a vacuum gauge could be connected to the main suction pipe. A reading of this gauge showed an excessive lift, leading to the examination of the suction pipe, with the discovery that sand and mud had sifted into the suction well and packed around the opening at the suction-pipe extremity, causing a decided throttling action to take place there, and actually strangling the pump. The pipe had been extended quite close to the ordinary bed of the river, in order to keep the intake sealed at extreme low water, and the possibility of drifting sand and mud burying the suction inlet at idle periods had hardly been considered.

The last section of the suction pipe consisted of a bell-shaped special, about 4 ft. in length, and stood in a vertical position. This piece was disconnected from the line, not without great difficulty, rather than to dredge out the drift sand, the removal of the latter being much harder to accomplish. This helped appreciably, the Venturi meter showing over 50 per cent of normal capacity at the next trial.

Following this came the dismantling of the casing in order to examine the impeller, which was found to be jammed with pieces of wood, to such an extent that half the water passages in the wheel were closed entirely, and the wood packed so tightly that it was necessary to drive it out with a heavy sledge hammer.

The impeller was of the inclosed type, and, while the waterways were amply large enough to pass any sphere or cube that would go through the screen opening, any object with a cross section slightly less than the open space in the screen, and of indefinite length, could enter the pump. In fact, some pieces, nearly a foot in length, were found lodged crosswise in the passages, forming a bridge for smaller pieces to collect against, until finally an almost solid obstruction was formed.

Pump No. 2 was also found to be similarly clogged, and the cleaning out of the débris resulted in both pumps resuming normal operation when restarted, the period of examination and relief requiring only one day for each unit. Without the Venturi meter, however, a much longer time would have been required to convince the customer of the trouble.

It was suggested to the steel-mill people that, in order to avoid a recurrence of this trouble, they install an additional screen of heavy wire and of 2-in. square mesh inside the bar screens, but whether or not this was done, the writer is unable to state. No further complaints, however, were registered.

Another clogging incident, which proved to be most unfortunate from a standpoint of sales, occurred in a pump-company shop-testing plant, where every advantage is presumed to be on the builder's side. One unit, out of 10 built, was on the test block as the result of strong contention on the part of the purchaser that the pumps were under specified capacity. All 10 units, which were of special design, vertical and self-contained, complete with motors and other electrical apparatus, had been erected and in service at their destination. The deficit in output was evident, and admitted by the builder's engineers at the installation point, who insisted, however, that it was caused by air carried in the water, although this point was hotly disputed by the purchaser's representatives. As 10 additional units, exactly like these, were to be purchased for another plant, it was agreed to return one unit to the builder's shop for a decisive test, the party at fault to stand the expense. If the shop test proved satisfactory to the purchaser's engineer, the order for the second lot was to be given immediately.

The returned unit was in due time arranged on the test block, and a preliminary run showed it to be well above the specified requirements. The purchaser responded promptly to telegraphic advices and the "official test" was started. It stretched over several hours, and not one reading at the specified head and speed indicated that the pump was up to capacity, much to the vexation of the builder's representatives, who, through the observations and results of the preceding day, had counted the new order as good as booked.

While the purchaser's engineer would give full consideration to any readings taken in his presence during that day, the results obtained the previous day were of no concern whatever to him, and he was

firm in his decision to permit no dismantling. Entreaties availed nothing, and the result of this inauspicious demonstration, after a message to the employer advising of the performance, was the immediate placing of the order with a competitive company.

A cage screen, about 6 ft. high and 3 ft. square, covered on four sides and one end with ½-in. square mesh, had been used as a protective device to surround the suction pipe, but a small block of wood, about 1 in. in cross section and 5 in. long, and heavier than water, had been inadvertently dropped inside the cage by one of the workmen erecting the pump, with the inevitable result that it was drawn into the eye of the impeller, completely shutting off one passage of the six-vane wheel, thus accounting for the ignominious "fall-down."

On the second day after this disastrous event, the unit had been reerected and performed perfectly, giving entire satisfaction, and bringing about the acceptance of the first lot complete. The inspecting engineer, however, could not be prevailed upon to rescind the order to the competitor; thus an insignificant block of wood lost one company about $50,000 of good business and swung it to another.

What happened at the builder's plant following the discovery of the block of wood, and concerning particularly those connected with the test, would furnish an interesting sequel, but rather sad to relate. But the company losing the order had the satisfaction of learning afterward that their pumping units entirely outstripped the competitor's product in later field tests, showing that the purchaser had acted too hastily for his own good.

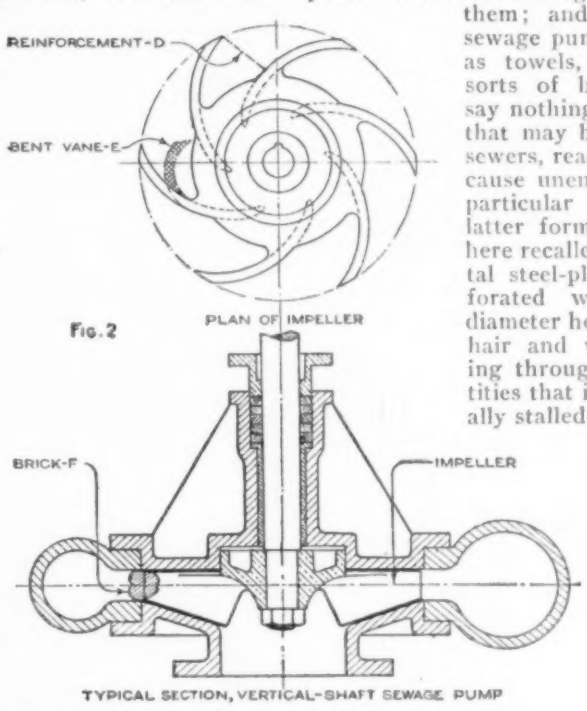


FIG. 2

Damage Caused by a Piece of Brick Drawn into the Pump and Jammed in the Casing Throat, Bending the Impeller-Vane Tips and Closing Two of the Waterways

An unlimited number of instances relative to the clogging of pumps could be recited here, but all bear some similarity to the foregoing. In cases with and without screens, and on nearly all new installations handling raw river or lake water, drainage or sewage pumping, this obnoxious feature has been outstanding. In the former, blocks of wood drawn into the suction bay, and water-logged sticks, have usually been the chief offenders; in the second, stones, bricks, tufts of grass, and even tin cans, jam the impellers to a point where it is a tough job to remove them; and in the case of sewage pumping, rags, such as towels, sheets, and all sorts of bed covering, to say nothing of other matter that may be carried in city sewers, reach the pump and cause unending trouble. A particular example, in the latter form of pumping, is here recalled where horizontal steel-plate screens, perforated with only ⅝-in. diameter holes, failed to stop hair and wool from passing through in such quantities that it almost continually stalled 15 and 18-in. centrifugal pumps, and frequent cleaning must be resorted to in order to prevent complete fouling.

Even where strict measures are adopted to keep solids from entering suction basins, "slip-ups" seem bound to occur. In the foregoing example, with flat perforated screens, a stone large enough to lodge in the impeller of a 15-in. pump mysteriously slipped through; and also with filtered water, drawn from a theoretically clear-water basin, parts of bricks are known to have passed through the pump, causing distortion and indentation of the impeller wheels.

The previously mentioned citations pertain generally to medium-size centrifugals fitted with inclosed-type, or shrouded, impellers. It is possible, however, with certain proficient screening devices recently placed on the market, to eliminate soiids almost entirely, the liquid on entering the

pump being practically clean water. In fact, recent installations of small 4-in. sewage pumps are known where inclosed-type impellers were specified by the consulting engineer, to be used in connection with such screening apparatus.

It is a proved fact, nevertheless, that the open or unshrouded type of impeller is far less susceptible to fouling, although it is of less efficient design. Its use is quite extensive today, particularly in cases where the screening is not perfect, and when the volume handled is comparatively small, such as may be encountered at isolated pumping stations, small towns, and elsewhere.

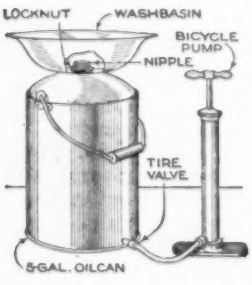
Even though this type of pump possesses the faculty of ridding itself to a large extent of foreign matter, numerous cases have come to light where entire stoppage has occurred, or where the pump has met with sufficient injury to render it practically useless. Figure 2 shows what happened at a plant in a southern city, where unscreened sewage and storm water were handled. Part of a brick fouled the pump, became jammed in the throat of the casing, and was struck hard blows by the rotating vane tips, which were mutilated to such an extent as to be almost unrecognizable, and put the pump out of commission. Not only were two of the waterways closed, but the remainder of the vanes were bent backward, as indicated at E; the diameter, and consequently the peripheral velocity, becoming so much reduced that the water leaving the impellers did not possess sufficient energy to reach the point of discharge. In order to guard against a repetition of this, all subsequent impellers were arranged as shown at D, with the web extended to reinforce the vanes.

In pumping water and stock mixture in paper mills, the open impeller again proves its value. Cases may be referred to where inclosed-impeller pumps have been removed for the reason that paper stock collected between the outside of the impeller shroud and the inner wall of the casing, and packed into such a solid mass as to act as a brake and seriously impede the rotation of the wheel. The best solution found was the substitution of the open-impeller pump, which, apart from expected frequent repairs, gives almost uninterrupted service.

While it is acknowledged that with the majority of pumps in use, the circumstances are such as to preclude all possibility of foreign objects entering, it is suggested, simply as a precautionary measure, that in all installations where even a small percentage of solids is carried with the water, by intent or otherwise, and especially where a positive means of gauging the output is not available, frequent dismantling for inspection be introduced as a measure of routine work, at regular intervals. Further, in order to encourage and assist in this, the purchaser should insist that accessible manholes and handholes be provided for this purpose, for it is to his ultimate advantage.

Small Forge Made from Oilcan

A very handy little forge, that will answer for small jobs when a regulation forge is unobtainable, can be made from an ordinary 5-gal. oilcan, a washbasin, and a tire pump.



A round hole is cut in the center of the washbasin, just large enough to fit over the nipple of the can. A locknut can be used to hold the basin rigid, but if this is not obtainable, a washer can be slipped over the nipple, and the cap of the can screwed down tight, after a hole of the proper size has been drilled or punched in the center to allow the air to escape. An ordinary tire valve is soldered near the bottom of the can and connected to the tire pump, which furnishes the necessary supply of air.—J. A. Stevens, East Boothbay, Me.

Shrinking Iron or Steel Rings

An iron or steel ring, band, or collar that has been made, or bored, oversize, can be shrunk several thousandths of an inch by a very simple procedure. The work is heated to a red heat and suspended from an iron bar in such a manner that the outer edge, to about one-third of the ring thickness, can be revolved in water. The sudden cooling of the outer metal causes it to shrink and contract the interior. The ring should be revolved quickly.—E. G. Larsen, Newton, Ia.

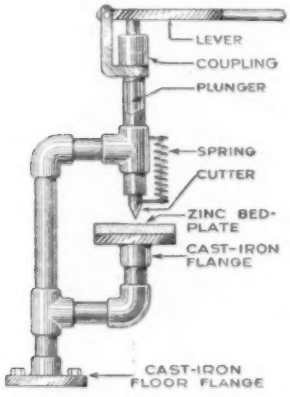
Testing Automobile Radiators

A southern radiator repairman, instead of soldering tin disks over the outlets of the radiators to be tested, uses a method that saves much of the time spent in soldering and removing the disks.

An old inner tube is cut up into disks, and one of these is placed over the radiator outlet and fastened there with one of the radiator hose clamps. This method also serves as a safety measure, as an excessive air pressure will have a tendency to distend the rubber instead of bursting the radiator.—J. E. Parker, Charlotte, N. C.

A Lever Metal Cutter

When cutting out work in light sheet metal, difficulty is commonly experienced in getting a smooth, even job with a pair of snips, and it is for such work that the handy little tool in the drawing was made.



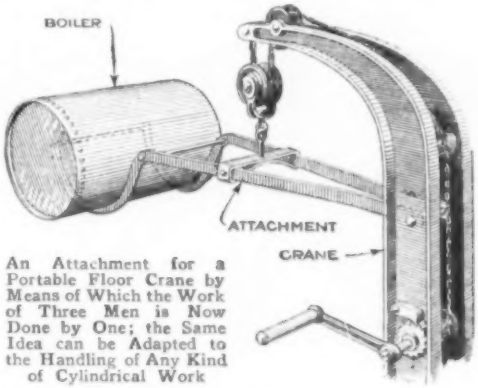
Three-quarter-inch pipe and fittings are used for the frame, and the lever and its support are made of ¼ by 1-in. flat iron. The plunger is made of steel, with the cutter ground and hardened to suit, a spring being used, as shown, to provide a return stroke. A piece of thick sheet lead, or zinc, underneath the work, prevents the cutter from being too rapidly dulled, and permits it to be forced through the metal to make the cut.—Sanford G. Ryder, Lynbrook, N. Y.

Preventing Water Action on Lead Pipe

Many waters affect lead water-supply pipes injuriously, acting upon them so that the resulting decomposition poisons the water. To prevent this, fill the piping with a warm concentrated solution of sulphide of potassium or sodium, and allow the solution to remain in the piping for about 20 minutes, the latter being plugged so that it remains full. This gives the inner surface of the pipe a coating that protects it from the water. The pipes must be thoroughly flushed before using.

Attachment to a Portable Crane

Having a great number of small boilers to pick up and handle which were too heavy for one man, a portable floor crane



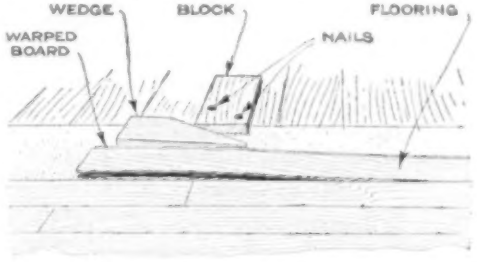
An Attachment for a Portable Floor Crane by Means of Which the Work of Three Men is Now Done by One; the Same Idea can be Adapted to the Handling of Any Kind of Cylindrical Work

was fitted with the attachment shown in the drawing. The boilers were to be picked up and placed under a machine; this required two men to hold the boiler in place, and another to operate the machine. Such an attachment can be adapted to handle any kind of cylindrical work.—J. H. Moore, Toronto, Ont.

Device Aids Laying of Flooring

When laying flooring, siding, or other boards provided with a tongue and groove, it is frequently found that some of the boards are badly warped, particularly when the lumber used is secondhand. Consequently some means of forcing the boards together is necessary if a good job is to be done.

The drawing shows how a wedge is used to force the warped board into line; a block is temporarily nailed in front of the warped part of the board and a wedge

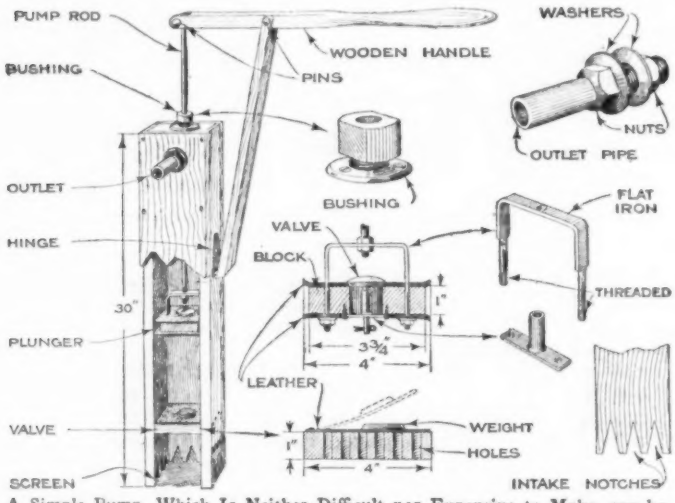


By a Simple Application of a Wedge, Crooked and Warped Flooring and Siding can be Straightened as It is Applied

is inserted and driven in enough to force the crooked board into proper alinement. —H. G. Schultz, Teaneck, N. J.

How to Build a Pump for the Camp

To avoid agitating the water in the camp spring by dipping the water out in buckets, in the time-honored manner of campers, the drinking-water supply can be kept clear by building and installing a



A Simple Pump, Which Is Neither Difficult nor Expensive to Make, can be Used for Numerous Purposes, Although Primarily Designed for Campers, to Prevent Agitating the Water of a Spring by Dipping from It with Buckets in the Usual Way

pump of the type illustrated; it is neither expensive nor difficult to make.

The pump "cylinder" is made of four 1-in. boards, 30 in. long, fastened together at the edges so that the inside will be just 4 in. square. See that all edges are straight and match well, and that they are well coated with white lead, before the boards are screwed together, to prevent leakage of air or water. Before assembling the cylinder, cut two blocks, 1 by 4 in. square, one for the top piece, and one for the valve support at the bottom, about a dozen ¼-in. holes being drilled through the latter. Clean out the chips and burrs, and soak the blocks in melted paraffin. Then cut a square piece of heavy leather of the same size as the block, attach a flat weight to the top, and finally tack one edge of it to the bottom block. This piece of leather, in its flat position, covers the holes, but uncovers them when it is lifted, the action being illustrated in the detail drawing. This block is to be nailed inside the square wooden tube, about 8 in. from the bottom, and the leather should be cut just small enough to prevent it from binding against the sides.

In the construction of the plunger or "sucker," take a block, 3¾ in. square; drill a 1¼-in. hole through the center; then tack a piece of leather, a trifle more than 4 in. square, to each side of the block, holes being made through the leathers to correspond with the one in the block. An old automobile valve is inserted through the hole in the block, to serve as the upper pump valve; this is guided by a piece of brass tubing and held in place by a long cotter pin.

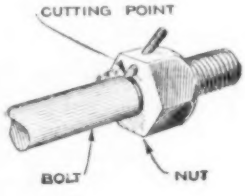
A U-shaped piece of iron fits over the valve in such a manner that the operation of the latter is not interfered with. The center of this U-shaped piece is drilled to take the pump rod.

Soak the plunger and bottom valve in water for a few hours to soften the leather, and after inserting them into place, screw the sides together, drill a hole through the center of the top block for the pump rod, and fit a simple gland, or bushing.

The pump is completed by adding the handle shown, and by tacking a piece of fine screen over the lower end of the pump after the sides have been notched. —L. B. Robbins, Claremont, Calif.

Thread-Cutting without a Die

When an additional length of thread is wanted on a bolt and no thread-cutting die is at hand, the work can still be done. On one of the faces of a nut that fits the bolt, drill a hole, proportioned to the size of the nut, at such an angle as to come out just above the threads on the bolt. A steel pin is ground to a point, so as to fit into the threads of the bolt when placed at the angle in which the hole is drilled.

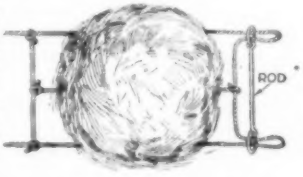


After providing proper clearance on the tool and tempering the point, drive it into the hole, allowing it to project so that it will cut but a part of the thread until the correct angle is obtained; then drive it on until it is in a position to cut the full thread as the nut is turned. The same

method can be used for cleaning out bruised and rusted threads and, by using a flange in place of the nut to hold the steel pin, the same effect can be obtained on pipe.—G. G. McVicker, North Bend, Nebraska.

Sling Aids in Unloading Hay

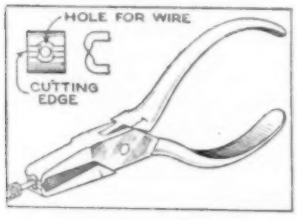
Getting hay into the barn without slings is pretty slow work; if the farm is not equipped with them, they can be easily and cheaply made, the time and labor saved more than offsetting their cost.



An iron rod, having a ring at each end, and about 40 ft. of rope compose the necessary material items and are assembled as indicated, the rod being about 6 ft. long. When the hay is to be unloaded, the loose ends of the rope are put through the rope loops on the opposite side which pass through the rings. About two such slings will carry a fair-sized load of hay into the barn.—Rufus E. Deering, Clements, Kan.

An Efficient Insulation Scraper

An ordinary pair of flat-nose pliers can be made into an insulation scraper that saves the wireman much time and work.

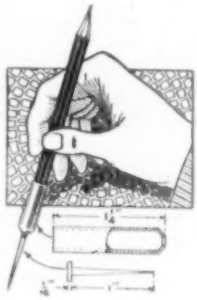


The points of the jaws are annealed and bent, as shown in the drawing, while still hot. As this particular tool was used for working with No. 20 gauge wire, a hole was drilled through the jaws with a No. 50 drill, although the size of the hole can be altered to meet differing requirements. The inside edge of the jaws was sharpened so that, when the wire was placed in the hole and the jaws closed, the insulation would be cut through.—Frank Jablecnik, Chicago, Ill.

¶When broaching soft, "stringy" steels, they often tear out at the edge of the hole. This can be prevented and the finish improved by heat treating, so that a scleroscope reading of from 25 to 30 is obtained.

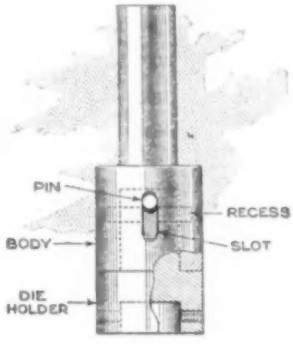
Tracing Point for Pencil

An easily made tracing, or needle, point for the artist or draftsman may be fashioned from a piece of steel or brass rod as shown. The rod is drilled to fit the pencil tightly; the point, being either sharpened, for pricking locations through drawings, or rounded, for use in tracing with carbon paper, may be soldered in place, or merely held by friction on the walls of the hole, as desired. The latter method is best, as the points then may be changed easily.



A Releasing Die Holder

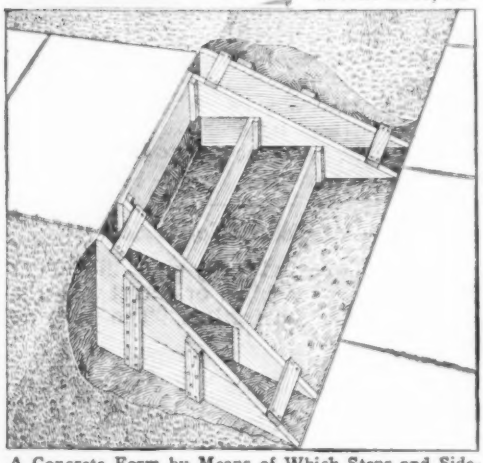
A very simple and easily made die holder for the screw machine, or turret lathe, is shown in the illustration. The body is turned on the shank to fit the turret, and bored out at the other end to take the die holder. While it is being bored, a recess is cut in the bore, as shown, a slot being afterward cut through the body at right angles to the recess, and in the exact center of it. The die-holder shank is turned a sliding fit in the body, and a short hole is bored in the nose to hold the die, which is held in the regular manner by a setscrew. With the die holder in place in the body, a pin, slightly less in diameter than the width of the slot, and a little shorter than the depth of the recess, is forced into a hole in the die-holder shank, in the position indicated. All working parts should be casehardened.



When the die has reached a point near the end of the cut, determined by a stop on the machine, it will continue to travel until the pin reaches the recess, when it will revolve freely. As the machine reverses and backward pressure comes on the pin, it will engage with the forward end of the slot, and the die will be backed off the work.

Timesaving Cement Forms

With the commonly practiced method of building cement steps for terraced lawns, retaining walls are usually built at the sides. To form these walls, the usual practice involves setting and pouring the side forms first, removing them and placing the step forms after the cement has set.



A Concrete Form by Means of Which Steps and Sidewalls are Poured Simultaneously, Making Two Sets of Forms Unnecessary and Saving Considerable Time

Time can be saved by building the forms for the steps and sides and pouring them at one time, the forms being similar to the ones shown in the drawing. The outer sides of the forms extend down to the bottom of the wall; the inner ones are cut to the form and size of the steps, and are held in position by the boards that form the front face of each step, and by cleats, attached as shown. By this method, steps and walls are cast in one piece.—G. E. Hendrickson, Argyle, Wis.

Breaking of Fan Belt Stops Engine

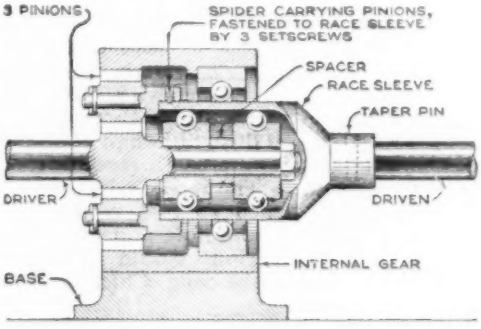
The owner of a 3½-hp. air-cooled gasoline engine had encountered considerable trouble, due to overheating of the engine when the fan belt broke. In order to prevent a recurrence of the trouble with its attendant possibilities of damage to the engine, he resorted to a clever arrangement.

He installed the low-tension magneto on the tool box opposite the fan, so that the fan pulley and that of the magneto were in line with the engine flywheel. Then, by using a single belt to drive both fan and magneto, all possibility of overheating if the belt broke was positively overcome, as in that case the magneto would stop, and no current would be flowing to the engine to ignite the explosive charge in the cylinder. Hence the engine would stop automatically.—L. F. Bockstanz, Ludington, Mich.

A Novel Planetary-Gear Mounting

The drawing is that of a ball-bearing mounting of a planetary reduction gear; it is highly efficient, and is so arranged as to take a shaft of minimum diameter with the fewest possible number of ball bearings.

It should be noted that there are three pinions mounted on the spider, which is fastened to the race sleeve by three setscrews, in the small designs, while in the larger sizes it is threaded on, the driving strain being in one direction only. The internal, or ring, gear is mounted in a cast-iron base, which is secured to the frame of the main bedplate. The driving pinion is cut out of the solid shaft, and on the end of the shaft are mounted two standard ball-bearing inner races, held the proper distance apart by a spacer. The outer race proper of the assembly is merely pressed into the housing. The mechanical advantages of this arrangement will be apparent, but it should be mentioned that one of the requirements of this design was the obtaining of ⅛-in. end play for each of the shafts. It is obvious that this arrangement is much simpler than the mounting of standard ball bearings with sliding sleeves, or quills.



A Novel Mounting for a Planetary Reduction Gear Which Permits the Use of a Shaft of Minimum Diameter and the Fewest Possible Number of Ball Bearings

The race sleeve is hardened and ground on both internal and external surfaces.—W. B. Bennett, Honesdale, Pa.

Testing Castings by Hydraulic Pressure

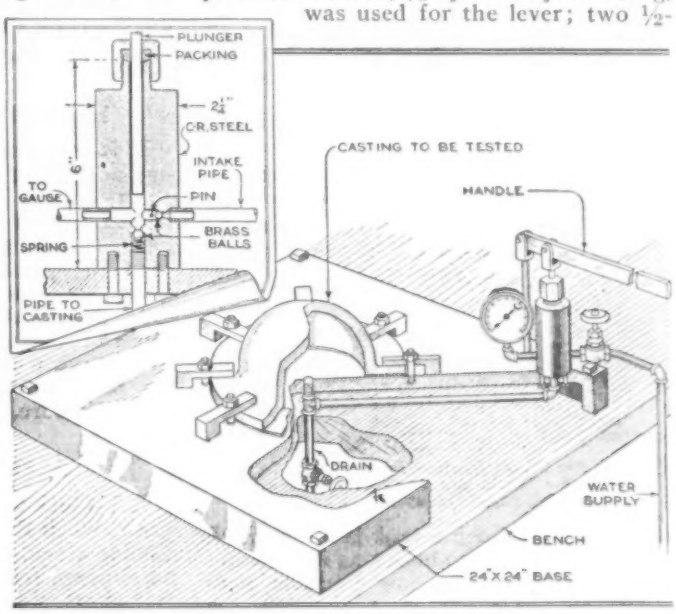
By E. J. BACHMAN

WE had wasted considerable money on labor and machine work by having castings prove defective after they had been worked up and assembled. The main requirement was that they withstand a pressure of 100 lb. per square inch, and the defects had not been detected until the parts were in place and the working pressure applied. We decided to test them first, and finish the perfect ones after scrapping the imperfect castings without doing more than truing up the face.

Not having the funds to spend for an elaborate hydraulic testing outfit, we made one of our own. The base was made from an extra 24 by 24-in. bench surface plate, the pump being attached to one corner. A hole, drilled in the center of the plate, was tapped from below and fitted with a ¼-in. nipple, tee, and drain pipe. Around this central hole a number of holes were drilled and tapped to receive ¾-in. studs, used to clamp the castings to the plate. Holes were drilled in each corner of the plate for the ⅝-in. lag screws used to fasten the outfit to the bench.

The pump, which was of the displacement type, consisted of a bronze plunger, operated by a long lever and working through a packing gland into a cylinder; this need not necessarily be bored to an accurate fit. The cylinder was machined from a piece of cold-rolled steel, the bore and the thread for the packing nut being machined at one chucking. The cylinder was then reversed in the chuck, and the opposite end drilled and tapped for ¼-in. pipe. After this, it was held in a drill press and drilled through with a ¼-in. drill at right angles to the bore, the ¼-in. hole being followed up by a 7/16-in. drill to a depth of 1⅝ in. The cylinder was next turned over and a 7/16-in hole drilled from the opposite side to a depth of ⅜ in. Both holes were tapped with the ¼-in. pipe tap. Two holes were drilled into the bottom of the cylinder, to take ⅜-in. cap screws for holding the pump to the base. A packing nut was bored and threaded to fit the top of the cylinder, a 25/64-in. hole being drilled for the plunger. This nut was made from 1 7/16-in. round steel.

The plunger was made from a piece of ⅜-in. rolled bronze, threaded on one end to fit the fork connecting it to the lever. The fork was made from ¾ by 1¼ by 2-in. flat iron and slotted to allow the handle to work freely. A stationary fork was fastened to a piece of ⅝-in. machine steel, threaded on both ends, one of which was screwed into the base, with its center 2 in. from the center of the pump. A piece of tire iron, ⅜ by 2 in. by 3 ft. long, was used for the lever; two ½-in. holes were drilled at one end with centers 2 in. apart, to which the forks were pinned. Two ⅜-in. brass balls were used as valves; one, the inlet, held by a pin, while the lower, or discharge, valve was held against its seat by a spring.



A Simple Hydraulic Testing Outfit for the Small Shop: It is Built of Materials That are Found in Every Shop, and Gives as Much Satisfaction as Any Elaborate Commercial Outfit

The outfit was assembled as indicated in the drawing, extra-heavy pipe being used throughout, with a high-pressure gauge attached to the pump cylinder opposite the water-supply valve. An easily accessible drain valve was also provided.

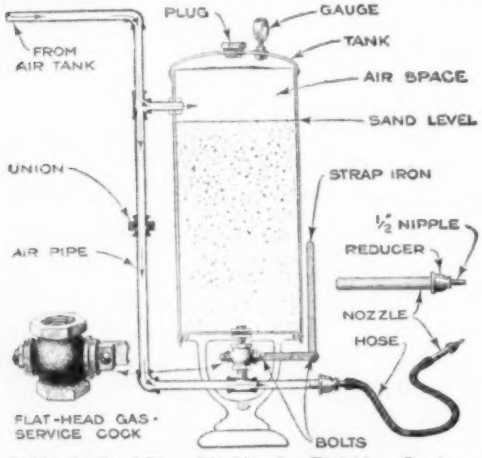
In use, a ring of ⅛-in. packing rubber was placed on the base, and the casting was applied and bolted down in the manner shown.

When making a test, the water supply was turned on with the drain closed; this gave about 60 lb. pressure to start with.

the water flowing past the valves in the pump without working the plunger. With the system full of water, very little movement of the handle was needed to run the pressure up to the limit of the gauge. With the test completed, the supply was shut off and the drain opened.

How to Make a Sand-Blast Machine

A sand-blast machine, of a type that has proved very practical, can be built of readily available materials and installed at a cost well within the most moderate purse, the principal requirement being an



A Simple Sand-Blast Machine for Finishing Castings, and Similar Work, can be Built and Installed in Any Shop at an Outlay of a Few Dollars

air-tight tank. Such a tank is to be found in an ordinary range boiler, as it is strong enough to stand the low pressure necessary to force the sand through the nozzle. An air pressure of only about 4 lb. to the square inch is needed for hard materials such as glass, vitrolite, marble, etc., while even less is needed for working on bronze and soft-iron castings.

The tank is connected in the manner indicated in the drawing, practically all of the piping being 1½ in. If a cross is used instead of the tee shown at the valve and the bottom fitted with a plug, a wire or rod can be inserted to clear out any obstruction. If the air is supplied to the tank under low pressure, no gauge or safety valve is needed, but if high pressure is used, they should not be omitted.

In filling the tank, the sand should always be run through a fine sieve, to remove all foreign matter, and thoroughly dried. The tank should not be filled higher than indicated in the drawing to avoid clogging the air pipe.—Charles L. Herbert, Chicago, Ill.

Mounting Reference Tables

Almost every draftsman has a few tables he must refer to frequently, and this usually means a considerable waste of time spent in looking up the tables in a book. In one drafting room this method was so inconvenient that it was eliminated by making up strips of the tables most commonly used and pasting them to the blades of the T-squares.

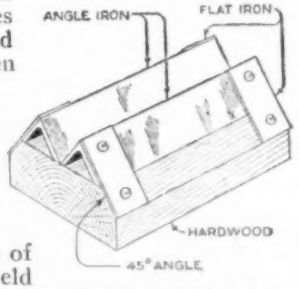
The tables were printed on tracing-cloth strips, the same width as the blades of the T-squares, and from these, blueprints were made. The durability of the blueprint tables was increased materially by a coat of shellac or varnish.—J. H. Kay, Cleveland, Ohio.

Stacking Work on the Broach

It is a common practice, when broaching a number of short pieces, to stack them on the broach to the necessary length. This is a dangerous practice, unless the length of the work is greater than the pitch of the teeth, as, if the length is less than this, a piece may drop down between the teeth and cause tooth breakage. Another important thing to observe when broaching work, is that the faces of each piece are finished true with the bore.

A Drill-Press V-Block

A V-block for use on the amateur's drill press, when drilling round, hexagonal, or similar stock, can be made at practically no expense from two short pieces of angle iron and a stout wooden block.



The outside edges of the block are beveled, and the pieces of angle iron, placed together on top of the block, are held in place by short pieces of flat iron, screwed to angles and block in the manner indicated. The angle of the sides is, of course, 45°, and holes, smaller than the screws, should be drilled in the angular faces before the screws are driven home. Inasmuch as such V-blocks do not require any machine work, and as they are so cheaply-made, a variety of sizes and lengths can be made up for special purposes.

Calibrating Pressure Gauges

Most instructions for making small pressure gauges give little or no information about their calibration; the usual instructions are to connect the gauge to an air line in series with a standard gauge. Even if a standard gauge is available, it might conceivably be inaccurate itself; in any event, the gauge maker should know how to construct apparatus for calibrating gauges, without depending upon other instruments of doubtful accuracy.

In this connection, the methods of a gauge manufacturer will be of interest. This concern manufactures gauges of all kinds and sizes, from automobile fuel-tank and oil-pressure gauges that have bent tubes with a wall thickness of only .002 in. and indicate from 4 to 6-lb. maximum pressure, to hydraulic gauges which indicate upward of 300,000 lb. to the square inch, and have a tube of tool steel, drilled from the solid, bent while red-hot, and finally tempered. When these gauges are ready for calibration, it is not done by connecting them up with a standard gauge.

The worker who calibrates the newly made gauges, or who sets the printed dials so that the hand registers correctly, has a small device, shown in Fig. 1, consisting of a plunger pump, actuated by a screw on which is a knurled handwheel. The pump chamber opens into an upright column, in which is supported a plunger; the bottom of the plunger is flat and rests on a flat seat. There is an opening in the seat whose area is ⅛ sq. in. exactly. The top of the plunger has a circular platform, about 4 in. in diameter, on which the weights are placed. Connected to the bottom of this column and open to the pressure from the pump, is a standard pipe connection to which the gauge to be calibrated is fastened. The whole thing is filled with oil.

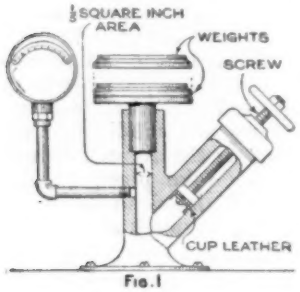


Fig. 1

Now it is evident that if a weight of one pound is placed on the platform it will require a hydraulic pressure of 5 lb. to the square inch to raise it, since the area of the opening in the seat under the plunger is ⅛ sq. in. There are about 100 lb. of brass weights, all machined and fitting into one another. The weights actually weighing 1 lb. are marked 5 lb., the 2-lb. weight is marked 10, etc. When the plunger of the pump is screwed down, the hand on the gauge will reach a certain point with one weight on the plate. Beyond this point it cannot go, for if the pump is screwed down farther, the weight will lift. A mark is placed on the dial (on the hand-calibrated type), and one may be sure that it is correct in proportion to the number of weights on the platform.

By changing the size of the aperture under the plunger, which is easily done with removable valve seats, the values of these same weights may be changed. Thus an area of .1 sq. in. would require 10-lb. pressure to lift a 1-lb. weight.

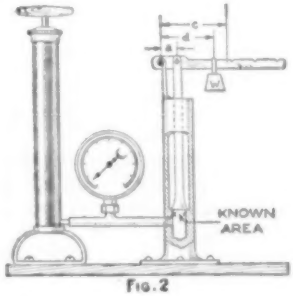


Fig. 2

An amateur can make a simple apparatus similar to the one described, using a set of ordinary avoirdupois weights; or a beam with a sliding weight may be constructed using only one weight. The pump may be a bicycle-tire pump. The column should be high enough to prevent the oil from overflowing when the pressure has reached the point where it will lift the plunger. This upright is shown in section; the rest is simple enough to understand.

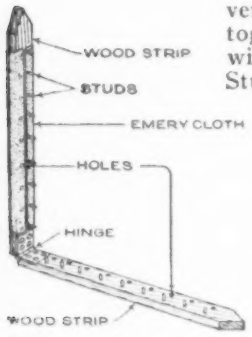
When notching the beam for the various positions of the weight W, its weight in pounds being known, use the following formula to calculate the distance of the weight from the fulcrum for each desired pressure:

$$d = \frac{a(pA - W_1) - W_2 c}{W};$$

where, d = distance from fulcrum to weight, in inches; c = distance from fulcrum to center of gravity of lever, in inches; a = distance from fulcrum to center line of valve, in inches; A = area of orifice beneath bottom of valve, in square inches; W = weight, in pounds; W_1 = weight of valve and stem, in pounds; W_2 = weight of lever, in pounds; and p = desired pressure, in pounds per square inch. Variations of this tester will suggest themselves to the maker, keeping, however, to the same principle.

Handy Mounting for Emery Cloth

An ingenious device for stretching emery cloth can be made from two pieces of hard wood of convenient length, held together at one end with a hinge, as shown. Studs on each strip fit into corresponding holes on the opposite strip; these studs are made by driving nails into the wood and then cutting off the heads and sharpening the ends with a file.

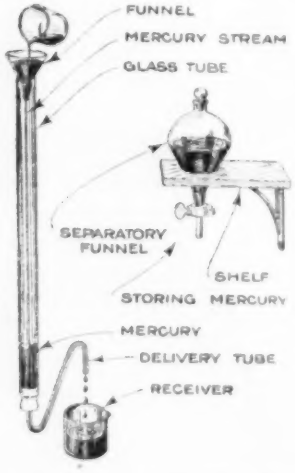


After one edge of the strip of emery cloth has been applied over one row of studs, the other edge of the cloth is gripped and held tight by closing the "file," as it is commonly called.—F. G. Jenkins, Dalton, N. Y.

Purifying and Storing Mercury

The usual method of purifying mercury by agitating it with warm water or hydrochloric acid is not always effective. When finely divided mercury refuses to coalesce, it is due to a coating of foreign matter, either solid or in solution. This can often be removed by simply squeezing the mercury through a closely woven cloth.

A device for washing mercury can be made as shown in the drawing. A glass tube, about ½ in. in diameter and 4 ft. long, is fitted at one end with a double-hooked tube, held tightly in place by a cork. The vertical height of the smaller tube should be at least one-tenth that of the larger one.



At the top, a funnel is provided that has its spout drawn out in a Bunsen flame to a very small opening, so that the mercury will be delivered in a fine stream.

Arrange the apparatus on the table with a receiver under the delivery tube. Pour in sufficient mercury to fill the delivery tube, and then pour in a solution of one part of ferric chloride in 15 parts of water, filling the larger tube nearly to the top. Remove any mercury from the receiver that was forced out by the pressure of the column of liquid.

The mercury is poured into the funnel, falling in a thin stream through the ferric chloride and flowing out of the delivery tube. The pouring is continued until all the mercury has been passed through the solution several times. If the solution turns green it should be renewed. The pureness of the mercury can be tested by washing and drying a small sample and noting if it has a tendency to "tail out," when running along a clean glass surface.

If it is thoroughly cleansed, it is then washed by replacing the ferric chloride with water, and again pouring the mercury through the device. The water should be renewed if it appears to become dirty or tinged. Dry the mercury by wiping its surface with filter paper or by passing it through a filter in which a large number of pinholes have been made.

Complete dryness is obtained by placing the mercury in an evaporating dish lined with several sheets of strong filter paper, and heating in an air bath, under a hood, to a temperature of 105° centigrade.

The advantage of this method of cleansing mercury over those in which the mercury is simply agitated with the cleansing liquid lies in the very fine subdivision attained at the orifice of the funnel. Since purification can only take place on the surface of the metal the desirability of increasing the surface as much as possible is at once apparent.

To keep mercury pure and dry, it should be covered with strong sulphuric acid, to which has been added a little mercurous sulphate. The apparatus used as a reservoir should be of such a construction that the mercury can be drawn from the bottom. A large separatory funnel is best for this purpose.—Thos. W. Benson, Philadelphia, Pa.

A Liquid Varnish Remover

A powerful liquid paint and varnish remover, that can be applied to the painted surface and will permit the finish to be scraped off in broad ribbons, is cheaply made.

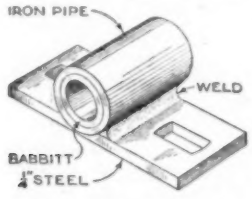
Obtain a clean 1-gal. can, and pour into it 1 qt. of denatured alcohol, and a similar quantity of benzol. Add ¼ lb. of

grated, or shaved, paraffin wax. Cork the can tightly and immerse it in a vessel filled with boiling water, allowing it to remain until the wax is melted. Remove the can from the water, and holding it under a stream of cold water, shake it until a thick emulsion is produced.

The thick mixture obtained is applied over the work with a brush, covering a small space at a time. The treated area is allowed to stand for a few minutes, or until the finish begins to blister and wrinkle. Then the old finish can be scraped off with a putty knife. For removing the finish from irregular surfaces where a knife cannot be applied conveniently, a scratch brush or steel wool can be used.—A. C. Cole, Chicago.

Making Inexpensive Shaft Bearings

A shop doing general machine work often has occasion to turn out one or two bearings, or pillow blocks, to take shafts of ¾-in. diameter or smaller. One shop has found the method described economical for making such bearings.



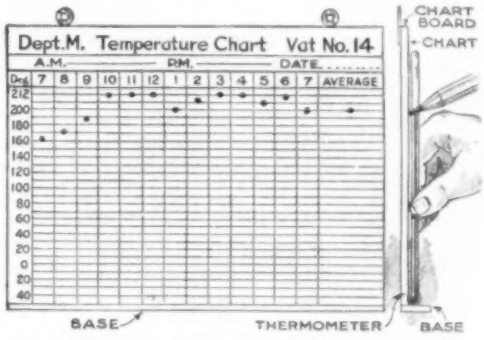
Pieces of pipe, with an inside diameter of ¼ or 5/16 in. more than that of the shaft, are cut to the proper length and welded to a plate of flat steel by means of an oxyacetylene torch. The inside of the pipe is babbitted, and the job is finished by providing the necessary holes for oil or grease cups, and slots for bolts.—Edwin Kilburn, Spring Valley, Minn.

A Temperature-Recording Chart

In dye shops and similar establishments, temperature readings are taken for the various vats of dyes and other fluids, these records being filed so that a proper check can be kept on the condition and strength of the solutions. As the dyes lose their strength, the temperature must be raised and a longer period of immersion is required, and it is a common occurrence for a careless or illiterate workman to misread the thermometer and, perhaps, spoil a batch of goods.

By the use of the thermometer chart shown in the drawing, anyone can make an accurate temperature record, even though he cannot count above ten.

A thin board panel is fitted with screw-eyes, so that it can be hung on the wall, and a narrow projecting strip is nailed to the bottom. A printed temperature chart is fastened on the board with thumbtacks; such charts can be printed at any print shop. They should be graduated, as shown, to correspond with the marks on



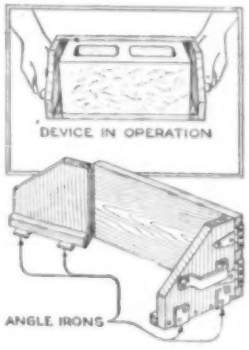
A Simple Method of Recording the Varying Temperature of Liquids Guards against Carelessness of Employes

the thermometer scale, and should have the time at which the readings are taken, and such other information as the date, etc., printed across the top.

When a temperature reading is to be made, the thermometer is removed from the liquid, wiped quickly and placed with the bulb resting on the baseboard, a dot being made on the chart at the height of the mercury column.

Carrier for Green Cement Blocks

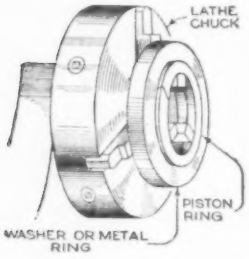
For removing green concrete blocks from the molding machine to the curing room, the device shown in the drawing is used by one manufacturer to reduce damage to the soft blocks. The carrier consists of a three-sided box, both ends being hinged to the back. A wooden strip along the inside bottom edge of each end is provided for attaching the angle irons, as indicated. A handle, for carrying, is attached to each of the hinged endpieces.



In using the carrier, the ends are swung back and closed upon the mold board on which the block is resting, so that it is supported on the projecting ends of the angle irons. Swinging back the ends releases the block.—Dale R. Van Horn, Lincoln, Neb.

Clamping Piston Ring for Turning

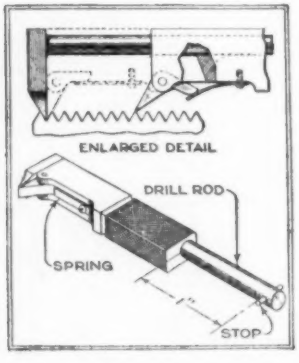
In overhauling an automobile engine I had to put in new piston rings; they were ordered from a dealer, who sent rings that were too wide to enter the grooves, but otherwise satisfactory. Instead of sending them back, I undertook to file them down to size, but found this a slow undertaking. Finally I decided the work could be done quicker on the lathe.



A metal ring, or washer, with an opening approximately the same as the outside diameter of the piston ring, was slipped over the latter, which was clamped to the lathe chuck from the inside, as indicated by the drawing. In this manner the ring was held on both diameters and turned down almost as easily as though it had been a plain washer.—Jos. Magis, Ouffet, Belgium.

A Novel Thread Gauge

To count the number of threads per inch when the pitch is small requires considerable care, especially when the work is internally threaded, as it is a very easy matter to miscount and perhaps spoil a piece of work that is to be duplicated.

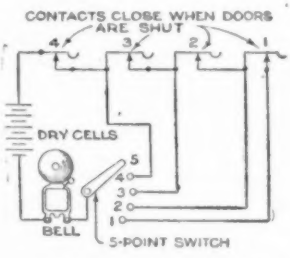


The gauge shown in the drawing is made from ¼ by ½-in. stock, drilled for a piece of 5/32-in. drill rod, and slotted at the end to fit the pivoted jaw. The end jaw is permanently riveted to the end of the drill rod, both jaws being shaped and mounted so that, when placed together, they will form a 60° angle; a light, flat spring bears against the pivoted jaw. A pin is inserted in the outer extremity of the drill rod, just 1 in. from the end of the block, when both jaws are together. A hole for a similar pin may be drilled ½ in. from the end of the block, for the measurement of short threads.

To operate the gauge, the jaws are placed together with the points in a convenient thread; then, with a slight downward pressure, the movable jaw is pulled back steadily. As the spring-actuated jaw rises and falls over the threads, a distinct knock will be clearly felt by the fingers. When the jaw has been pulled back to its limit of travel, the number of "knocks," or "clicks," counted will indicate the exact number of threads to the inch. The gauge is, of course, only accurate where there is an integral number of threads per inch.

Night Watchman's Signal Circuit

All the outside doors of a certain establishment were equipped with self-operating spring locks, and it was one of the duties of the night watchman to see that all these doors were properly closed. Wishing to reduce the amount of walking he had to do to the minimum, the watchman installed a pair of contacts on each door, in such a manner that a circuit was established or broken when the doors were opened or closed. He wired the doors as shown in the diagram, using a bell, battery, and a five-point switch. If the bell operated on the first contact, all the doors were closed. If it failed to operate on this contact but rang when the switch was turned to the second point, the first door was open, and so on.—C. M. Crouch, Minneapolis, Minnesota.



Window Display for Hosiery Sales

Pedestrians passing a shop window are suddenly surprised when a stocking, which has been lying in a crumpled heap on the floor, suddenly jumps up and appears as though a leg had been inserted into it. After remaining in the upright position, it as suddenly crumples up and falls back to the floor, the operation being repeated indefinitely.

The secret lies in an electric fan concealed beneath the floor of the window. The fan is operated by a make-and-break

socket and is placed pointing straight upward. A cone, open at both ends, is placed over the fan, with the smaller opening fitting the top of the stocking snugly, the edge of the cone, of course, being concealed. The make-and-break circuit starts the fan, which blows air into the stocking and causes it to distend. As soon as the circuit is opened the fan stops, and the stocking collapses.—F. C. Davis, St. Joseph, Mo.

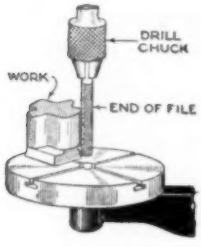
Novel Method of Lowering a Tank

An eastern ice-cream manufacturer, wishing to enlarge his plant, was obliged to add another ice-making tank, which had to be built and riveted on the second floor of the establishment.

The tank was received from the factory in sections and was put together on the spot. In order to rivet the bottom seams, the tank was elevated about 3 ft. above the floor. Consequently, after the seams had been calked and tested, it was necessary to lower the container into its permanent position on the floor. Inasmuch as the tank was located in a corner and fitted tightly against two walls, lowering it presented a real problem, as the roof beams were too light to permit the use of the ordinary lifting tackle. The boss boilermaker, being a man of parts and ingenuity, solved the problem by jacking up the corners, removing the supporting blocks and inserting cakes of ice in their place. As the ice slowly melted, the tank gradually settled into place.

Filing in the Drill Press

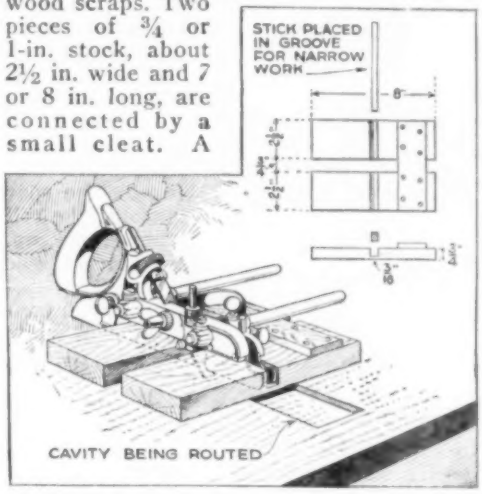
When peculiarly shaped punches are to be filed, much time may be saved, where a filing machine is not convenient or available, by utilizing the drill press. The drawing shows the method followed; a piece of a round file, of a cut suitable to the degree of finish desired, is held in the chuck, and, while the file revolves, the work is pressed against it.



One advantage of this method is that the sides of the piece being filed are kept parallel, while, if a taper is desired on the work, this may readily be obtained by the use of properly tapered packing pieces, on which the work is held.

Plow Plane Converted into Router

The owner of a plow plane also possesses a router, if use is made of a simple attachment composed of a few hardwood scraps. Two pieces of ¾ or 1-in. stock, about 2½ in. wide and 7 or 8 in. long, are connected by a small cleat. A groove is dadoed across the center of the two pieces, so that there will be about 3/16 in. of stock left at the bottom. The width of this groove will depend to some extent upon the work, but from ½ to ¾ in. will answer for most purposes; if the work is to be narrow, a narrower groove will be necessary, although it is possible to use the wider groove for narrow work by inserting a strip of wood at one side of the plane.



A Makeshift Device for Converting a Plow Plane into a Router Makes It Possible to Work in Grooves as Narrow as One-Eighth Inch

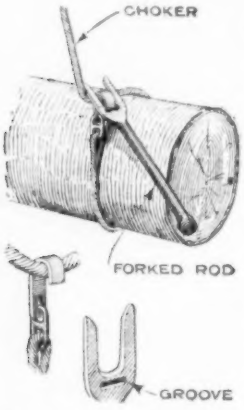
In use, the variable bottoms of the plane are spread until they can be just wedged into the groove of the routing attachment and the cutter is advanced to the desired depth. The tool is then used as any other router. The weight of the plane and the pressure of the hand upon it keep it from working out of the groove, and the friction of the plane bottoms against the sides prevents the tool from creeping.

Although the attachment is a makeshift, it is capable of routing very narrow grooves for which no standard router is made. Using such a device, it is possible to work in grooves as narrow as ⅛ in.—Henry Simon, Laguna Beach, Calif.

¶Materials to be broached, with a scleroscope reading of much harder than 30, will cause excessive wear on the broach; this can be avoided by annealing so as to bring the reading down to between 25 and 30.

A Useful Logging Device

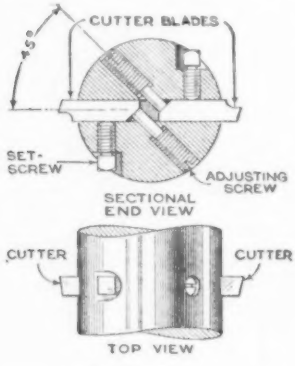
The drawing shows a simple device for hooking and unhooking open-face chokers. In use, the choker is hooked around the log, which is then drawn in to the landing, where a "chaser" stands, ready to unhook it. However, the main line passing through the bull block on the spar tree holds the tail of the choker up, drawing it so tight that it often requires several men to hold slack while the hook is thrown off.



It is in such cases that the forked rod, which is made of steel, demonstrates its usefulness. Just back of the closed end of the fork is a horizontal groove in which the end of the hook is placed to prevent it from slipping. Applied as indicated in the drawing, with the arms of the fork over the choker, it is only necessary to lift up on the handle and slip the hook over the choker.—J. F. Chetlain, Shelton, Wash.

Adjustable Boring-Bar Cutters

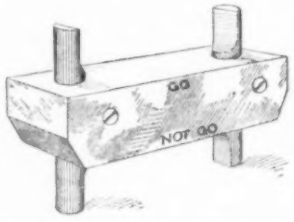
In making cutters for the boring bar of a vertical or horizontal boring machine, the usual practice is to make a transverse hole through the bar, and set the cutter in the squared hole, with a setscrew above, to hold it in place. This method requires that the setscrew be loosened and the cutter tapped forward with a hammer, to increase the depth of cut. A simpler method of setting up the cutter uses a separate adjusting screw, set at an angle of about 45°, as shown in the drawing, a turn of the screw serving to drive the cutter forward an exact distance. With slight practice, the cutter can be moved the desired amount without frequent trials, such as are necessary when moving it an indefinite amount by driving it forward with a hammer.



Apart from the advantage of setting the tool forward small fractions of an inch for making finishing cuts, this method allows two cutters to be used, on opposite sides of the bar. The tendency of the tool to cut smaller at the center than at the beginning of the cut, due to springing, is also avoided.—G. A. Luers, Washington, District of Columbia.

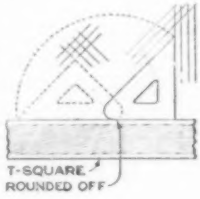
A Simple Limit Gauge

As a general rule, limit gauges are more or less expensive, but the drawing shows a simple gauge of this type that is also cheap to make. The block that forms the body is made of ordinary carbon steel, but the pins are, of course, of hardened tool steel. One side of the pins is ground off to the "not-go" size, while the other gives the minimum limit of tolerance, or "go" size. Two screws serve to hold the pins so that they can be removed and replaced by pins of different size, as may be necessary, thus making the one block serve for more than one gauge.



Facilitating the Use of the Triangle

A draftsman has found that by rounding off one of the corners of his triangle, his work is speeded up considerably. A simple twirl with one finger throws the triangle over from one position to another. An arc, of about ¾-in. radius, is scribed on the triangle tangent to two of the sides as shown; then the corner is filed or ground down to the line. This seems a very simple trick, but it is often the simplest things that retard the work, and where a triangle is constantly in use, a few seconds saved each time it is moved will make a considerable saving in a few days.—C. Nye, New York, N. Y.



Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

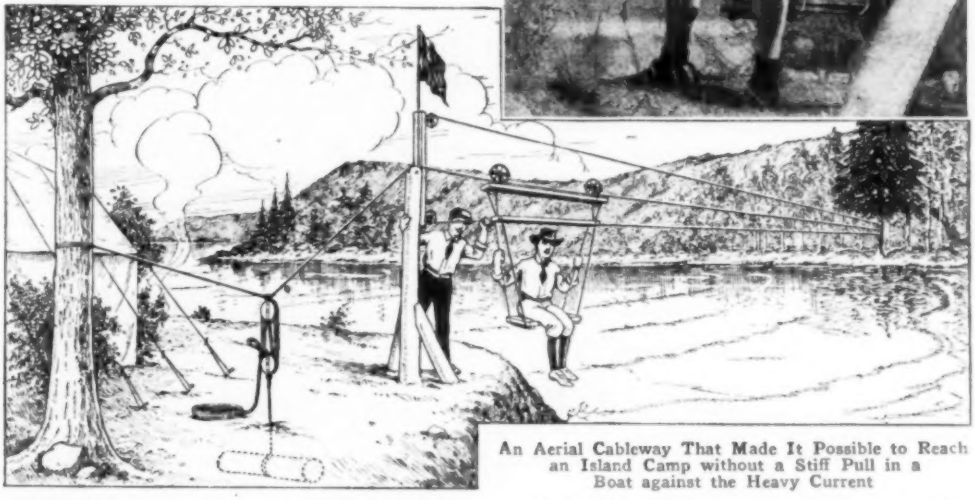
An Aerial Cableway for Island Campers

By F. H. ELLIS

WITH permission given them to use an island in midstream, on a river close to a western city, two young men set about making a summer camp. At the site selected for the camp, the river has a current of about 10 miles an hour. This, together with the fact that both campers worked in the city during the day, made it inadvisable to buy a canoe, and the overhead cableway illustrated was built and operated with eminent satisfaction.

A line was first carried to the island by allowing it to drift down from upstream on a log raft. By means of this line, a wire cable was pulled across to the island from the mainland, this being the same kind of galvanized cable as that used in telephone-line construction work for guy wires, and similar purposes. The ends of the cable were secured to a tree on each side of the river, and the island end was run over a post set into the ground. To keep the cable taut, a good-sized log was buried several feet underground between the post and tree to which the cable was fastened on the island. A small block and tackle between the cable and the buried log made it possible to draw the cable as taut as necessary.

The plank seat was suspended from the cable by means of two grooved pulleys, and was pulled back and forth from either bank by a light rope passing over pulleys at each terminal, the ends of the rope being fastened to the seat.

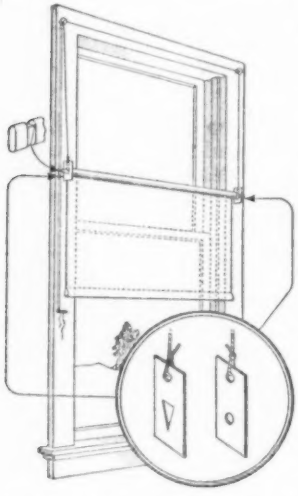


An Aerial Cableway That Made It Possible to Reach an Island Camp without a Stiff Pull in a Boat against the Heavy Current

With this arrangement, there was little possibility of any of the campers' effects being stolen, because, when in the city during the day, the seat was securely locked to the terminal on the mainland.

Window-Shade Fixture to Admit Light at Top and Bottom

A simple and effective method of hanging a window shade so that light may be admitted from below or above, or both, is shown in the accompanying drawing.



An ordinary shade roller is used; the flat pin at the end of the spring is provided with grooves on each side, and the round pin on the opposite end is pulled out with a pair of pliers and a small round-head screw substituted for it.

Two pieces of sheet metal, ⅜ by 2 in., are provided, and a 3/16-in. hole is drilled in the upper end of each; a round hole is drilled through the opposite end of one piece, and a triangular slot is cut in the lower end of the second piece.

When the two metal brackets have been finished, the flat pin of the roller is inserted into the triangular opening, the filed notches serving to hold it in place, and the opposite end is held in place by the screw. Cords are fastened into the holes provided in the upper ends of the pieces and run upward, one on each side of the window casing, through screweyes at the top. Both cords are passed through the same screweye on one side and down to a hook in the window frame.

As will be apparent, the shade and roller can be raised or lowered to any position by manipulating the cords, the shade being operated in the usual manner.—Mrs. Ruth Darling Shultis, Lansing, Mich.

Waterproofing Tents

Take ½ lb. sugar of lead (poison), and ½ lb. powdered alum; dissolve them in a bucket of rain water, and pour off into another vessel; steep the tent material in this, allowing it to soak thoroughly.

If the quantity of liquid is not sufficient, increase in the same proportions. Hang the material up to dry, but do not wring it. This process is also suitable for waterproofing garments.

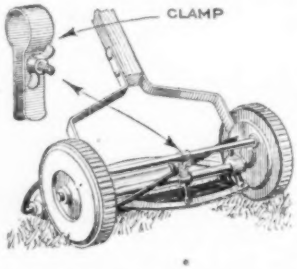
Burned-Out Lamp Makes Good Spark-Plug Tester

Every motorist needs a spark-plug tester at intervals; a hammer, screwdriver, or other metallic object, provided with a nonconducting handle, will answer, but more accurate results will be obtained if a tester is used in which the spark gap is brought out into full view.

A burned-out headlamp bulb will give excellent results and afford the maximum protection from an electric shock. A globe with single contact will serve best, as the connections are made more simply with this type. A piece of metal should be soldered to the base of the bulb and allowed to project parallel with it, so that it can be grounded against the shell of the plug. With the center contact of the bulb held against the top of the plug and the projection against the shell, a spark will easily jump across the gap formed by the broken wires in the partially exhausted bulb. This affords a large spark that can be readily seen, yet, owing to the vacuum, the resistance is not sufficient to affect the sensitiveness of the device.—S. E. Gibbs, Ames, Ia.

A Safety Device for the Lawn Mower

Children are natural-born investigators, and anything of a mechanical nature excites their curiosity, especially if they are warned not to touch it. For this reason many children get their fingers hurt more or less seriously playing with lawn mowers, and, as it is not always convenient or possible to put the mower out of reach, the simple little attachment shown in the drawing will be appreciated by most parents.



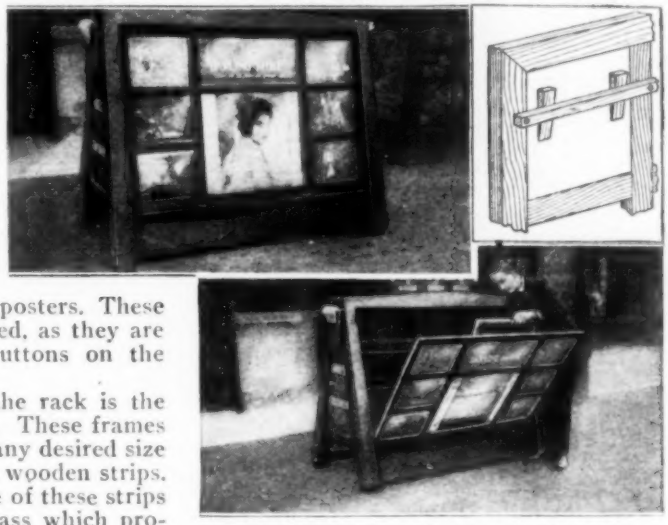
A strip of flat iron is bent to form a clip and drilled for a bolt and wingnut. To lock the revolving blades, slip the clamp over the guard bar and one of the knives and then tighten the wingnut. In this position the mower can be inverted and the wheels will run, but the knives will not move. When the mower is in use, the clip is turned up or pushed to one side and the screw tightened to hold it in position while using the mower.

A Well-Designed Poster and Advertising Display Stand

An attractive and substantial rack, or stand, for the display of bulletins and advertising matter of any kind, permits the matter to be easily changed, and protects it from the weather even when it is set in an exposed position.

Built in the shape of a wedge, the holder cannot easily be upset as with the ordinary easel type. A triangular panel, fitted into each end, can be used as a support for small posters. These panels can easily be removed, as they are held in place by metal buttons on the inside.

The special feature of the rack is the hinged frame on each side. These frames are divided into panels, of any desired size and shape, by ¼ by 2½-in. wooden strips. The edges on the underside of these strips are beveled, to hold the glass which protects the display matter from exposure. Midway across each tier of panels wooden strips are fastened to the back of the frame. These furnish simple and convenient holders for wedges inserted behind them in the manner indicated by the small drawing, after the posters, with a suitable cardboard or thin wooden backing, have been inserted. Thus, it is not necessary to use tacks each time a poster is put in place or removed.—John Anson Ford, Los Angeles, Calif.



Open and Closed Views of a Substantial and Attractive Rack for the Display of Advertising: Even When Placed in an Exposed Position the Contents are Thoroughly Protected and the Matter is Easily Changed

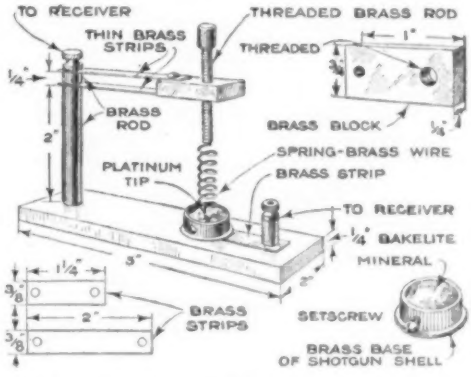
How to Make a Good Mineral Detector

By F. L. BRITTIN

A MINERAL detector should be a part of every radio amateur's equipment, as one never knows when the audion tube may burn out, and this sometimes happens right in the middle of an important message; it is then very handy to be able to switch the mineral detector into the circuit and continue receiving. A good mineral detector is a part of almost all commercial sets, where traffic must go on regardless of accidents. The detector described here is simple to build, and can be constructed from odds and ends about the station.

The base is of bakelite, or may be of any insulating material, ¼ by 2 by 5 in.; the upright post is of ⅜-in. brass rod, the lower part, 2 in. long, drilled and threaded at each end to take a ⅛-in. brass machine screw, the upper part being ¼ in. long, drilled through to clear the upper binding screw. This screw is 1½ in. long and serves to hold the two brass strips in place in addition to acting as a binding post, as shown in the drawing.

The small brass block is drilled to take a small bolt, which clamps the brass strips loosely, allowing a side swing to the block. The block is also drilled and threaded to take the knurled-head screw to which the spring wire is soldered; the



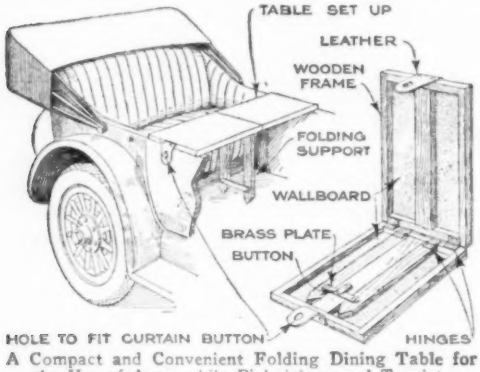
A Simple but Substantial "Cat Whisker" Detector: This should Be a Part of Every Radio Outfit, No Matter How Well Equipped

contact point on this spring should be tipped with platinum, which may be done by a jeweler if the necessary facilities are not at hand. The mineral is contained in a little brass cup, made from the base of an empty shotgun shell. A small hole is drilled through the side of the base and threaded to take a small setscrew, which holds the mineral rigid. The percussion cap is removed from the end of the shell cap, and a short flat-head machine screw holds the cup in place on the base. This screw also holds the short brass strip leading to the other binding post.

The detector is neat and effective, and may be mounted on the receiving panel.

A Convenient Table for the Auto

A family of five persons always takes the lunch basket along when they go for a



A Compact and Convenient Folding Dining Table for the Use of Automobile Picknickers and Tourists

day's outing in the car. It is not always easy to find a leafy bower with a clean, level space on which to spread the lunch, and besides, it is vastly more comfortable and less bothersome to eat in the car.

To add to the comfort and convenience of such trips, the very light and compact folding table shown in the drawing is carried along. The frame is made of 1½ by ⅜-in. whitewood, in two parts which are hinged at the middle, while the legs are hinged to one section and joined together near the lower end with a brass plate. The frames are covered with extra-thick pressboard, or wallboard, glued to the wood. Leather tabs are provided at each end, which are attached over the top curtain fasteners on the edge of the car. The whole is painted or varnished as desired, to make it waterproof and to improve the appearance.—A. G. Rollins, Portland, Me.

Surgeons' adhesive tape can be used for mending tears in raincoats.

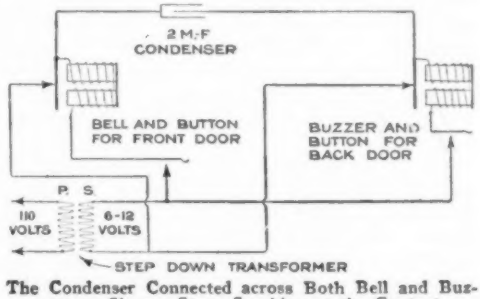
Rust-Proof Coating for Bolts

When the nuts and bolts of an automobile are replaced after an overhauling, it is sometimes the custom to coat them with hard grease or graphite. This is, ordinarily, an excellent practice, as the lubricant permits the nut to be drawn up tighter, and, at the same time, permits it to be removed more easily. Underneath the car, however, there is little that can be applied to the fender nuts, body bolts, etc., that will prevent their becoming so rusted that they can only be removed with difficulty. Some form of paint is frequently used, but this wears off, and the rust continues to accumulate.

Rusting of such exposed bolts can be effectively prevented by dipping both nut and bolt in thin shellac, and applying a little more over the end of the bolt after the nut has been tightened. As this treatment will prevent rusting, the nut can be easily taken off, and as the shellac will, in addition, exert a tendency to prevent the nut from turning, the likelihood of loose and rattling bolts is considerably reduced.

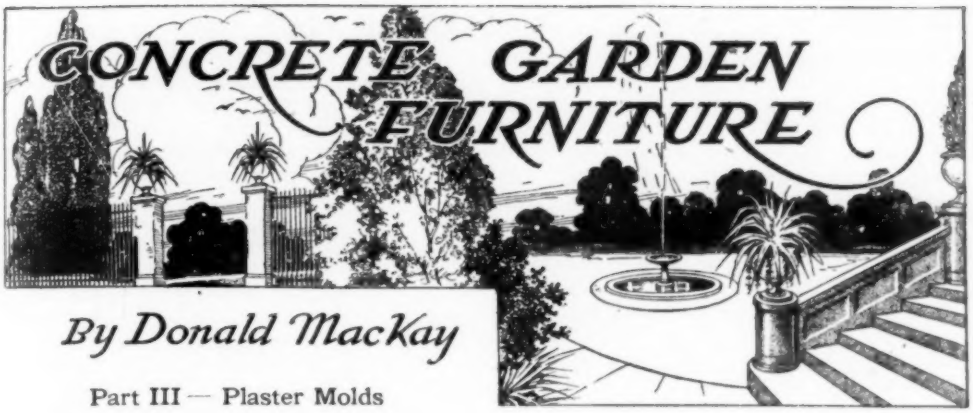
Eliminating Spark on Bell Contacts

After installing a small step-down transformer to operate the bells in my house, I found that the contacts on the bells were sparking badly, and would soon burn out. Shunting a condenser across the contacts to absorb the spark is a common practice, and I decided to do this for each bell. To avoid the necessity of buying another condenser, I devised the method of wiring shown in the drawing; this allows one condenser to serve both bell and buzzer. When the front-door bell is rung, the condenser is connected across its contacts through the contacts on the buzzer, and vice versa. This arrangement does not



The Condenser Connected across Both Bell and Buzzer, as Shown, Stops Sparking at the Contact Points, Thus Preventing Undue Wear

interfere with the simultaneous use of both bell and buzzer.—C. M. Crouch, Minneapolis, Minn.



By Donald MacKay

Part III — Plaster Molds

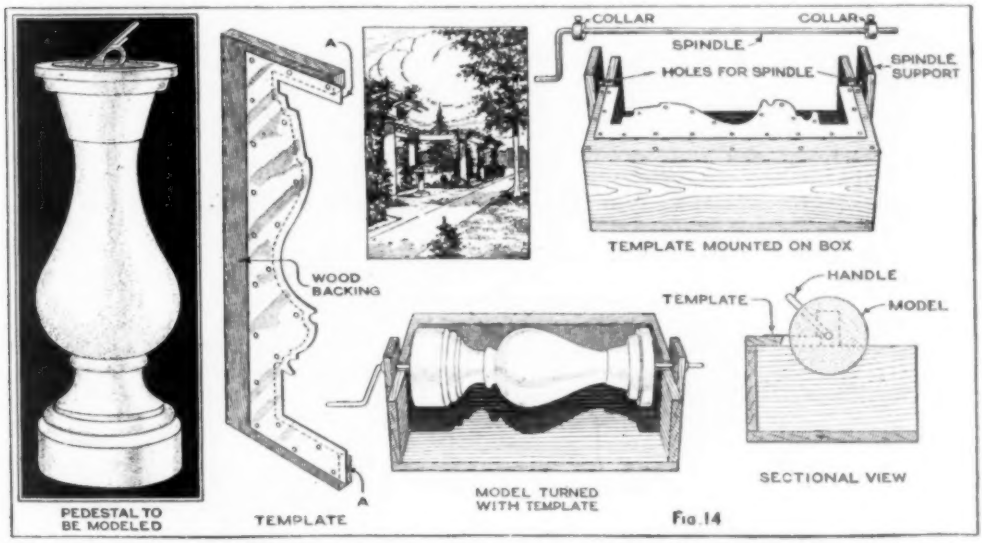
THE method of making models in plaster, of pedestals, balusters, and other objects of circular cross section, and of making a mold from the model, is very similar to the process of making plaster lamp bases, described on page 631 of the April issue.

It is better for the amateur, especially if he is doubtful of his ability to produce a neat and harmonious design, to procure a wooden baluster or column, shellac it well, and use it as a model on which to build his mold. Balusters or columns may be purchased, at a very small cost, from any dealer in millwork, and will save much work and time. Those who wish to work out their own designs, however, will be able to do so by following the instructions given in this article.

The first thing to do is, of course, to select the design. This should be as simple as possible, with no undercut portions that would cause trouble in withdrawing the model from either the template or the mold.

Obtain a piece of galvanized sheet iron, about 6 in. wider than the largest radius of the design, and about 3 in. longer than its height. True up one edge, and, using this edge as a center line, lay out one-half of the design upon the sheet. With cold chisel and snips, cut out to the approximate shape of the design, finishing with fine half-round files.

This sheet-iron template is then mounted on a backing of 1-in. lumber, as shown in Fig. 14, in such a manner that the edge of the sheet iron will project from $\frac{1}{8}$ to $\frac{1}{4}$ in. from the wood, which should follow the outline of the design closely. This backs up the template. The latter, with its wooden backing, is then nailed to a stout box, as shown in the upper right-hand corner of Fig. 14, the



While It Is Easy to Obtain Wooden Balusters and Columns from Which Molds may be Made, This Illustration Shows the Method of Originating Models in Plaster by Means of a Template

box being of sufficient depth to clear the largest portion of the design. A spindle, which may be either of light iron rod or pipe, is then made as shown and provided with collars, which bear against the spindle supports, or bearings, and prevent end motion.

The spindle supports are screwed in position, and holes to fit the spindle bored in them; the centers of these holes must be exactly in line with the edge of the sheet-iron template, and the spindle, when inserted, should bear against the template. When laying out the template, provision should be made for the diameter of the spindle; that is, as the center of the spindle will be the center of the finished model, the edges marked A on the template must be cut back for a distance equal to half the diameter of the spindle.

Set the spindle in place, adjusting the collars, so that, while allowing it to turn freely, there is no end motion; cut a piece of burlap, a couple of inches shorter than the design and about a foot in width, dip this in a thin plaster mixture, and wrap around the spindle, tying it with pieces of cord if necessary. This affords a good foundation for the plaster, and also reinforces it.

Mix fine casting plaster in water to a thick creamy consistency, and commence pouring over the burlap-wrapped spindle, at the same time turning the latter by means of the crank. As the plaster builds up, it will be shaved off by the template. When the model approaches completion, thin the plaster just a little.

When the model is completed, remove it by unscrewing the spindle supports, and set it aside to harden for about 24 hours.

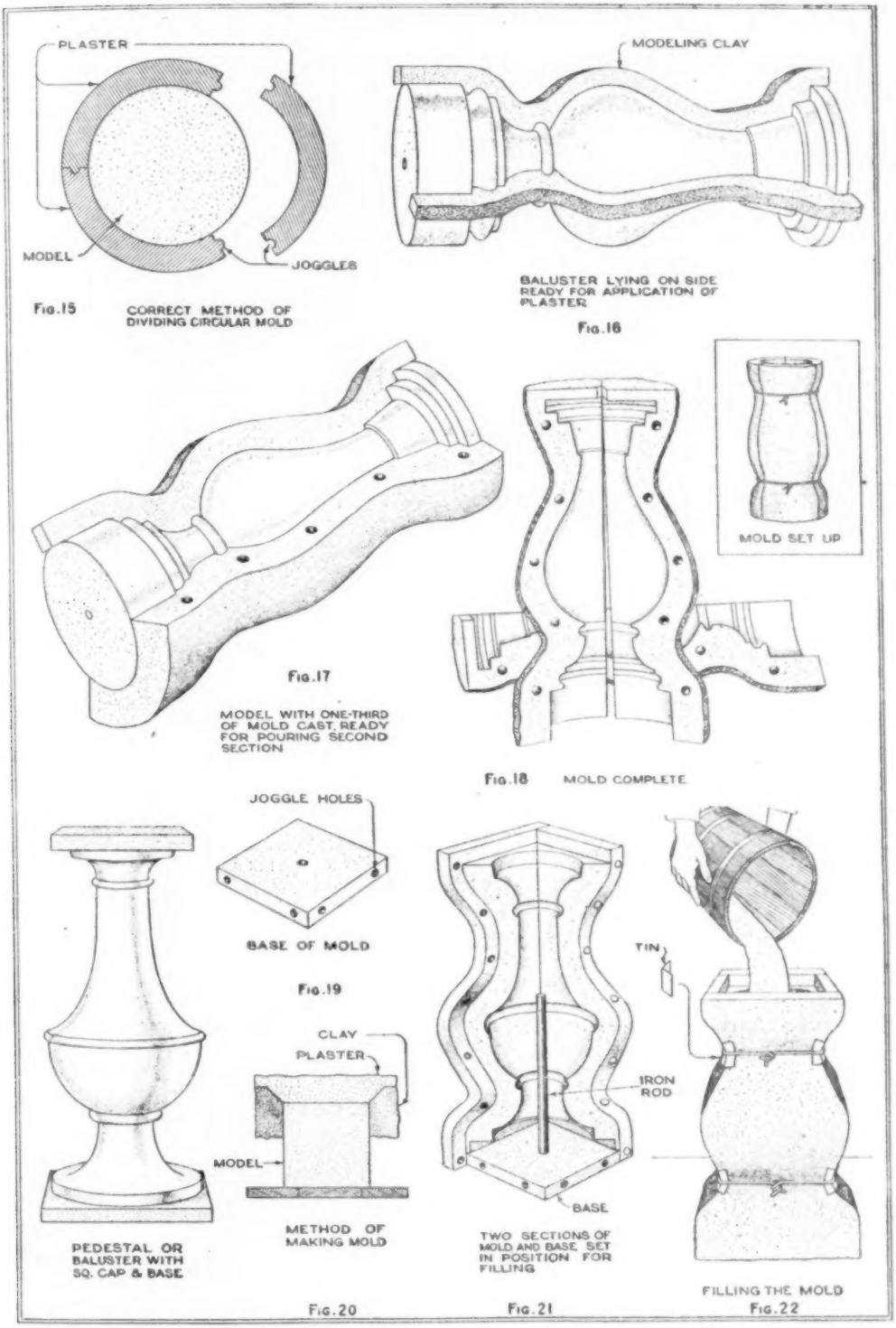
At the end of this period, saw the spindle off close to the ends of the model, shellac the latter, two or three coats, allowing each coat to dry before applying the next, and it is ready to be used in making the mold.

The proper method of dividing a circular mold is shown in Fig. 15. If the mold is made in two pieces, one piece is quite likely to be a little larger than the other; that is, the division would not be exactly on the center line of the mold, so that one piece would embrace somewhat more than a half circle, making it impossible to withdraw the model without breaking the edges of the mold. By making the mold in three parts, the risk of such damage is eliminated.

Lay the model, or the wooden baluster, if this is employed, on its side. Build up, as shown in Fig. 16, two walls, or dams, of modeling clay, about 2 in. square and about 120° apart. When these have set a little, coat both dams and the surface of the model between them with lard oil, then fill in between the dams with plaster to the same height as the clay, smoothing it off roughly on the outside. If desired, when the plaster has been poured on to about half the desired thickness, pieces of burlap may be used to reinforce it, as described for the making of the square-vase mold in the June installment.

Allow the plaster to harden thoroughly, then strip off the clay, build up another clay dam, 120° farther around, scrape out the "joggles," and shellac the exposed edge of the part of the case already cast. When dry, oil the dam, model, and edge of the first section, and pour on plaster to make the second section. When this, in its turn, has hardened, strip off the clay, cut the joggles, shellac and oil the exposed edges, and pour the third section. The plaster of each section may be carried over the end of the model if desired, as shown in Fig. 18, to form a bottom for the mold, although, if the mold is to be used on a good level foundation board, this is not absolutely necessary. When thoroughly hard, the mold is well shellacked on all surfaces, and is then ready to be assembled and filled with the mixture of one part cement, two parts sand, and three parts clean broken stone or gravel, which must not be larger than will pass through a ¼-in. screen.

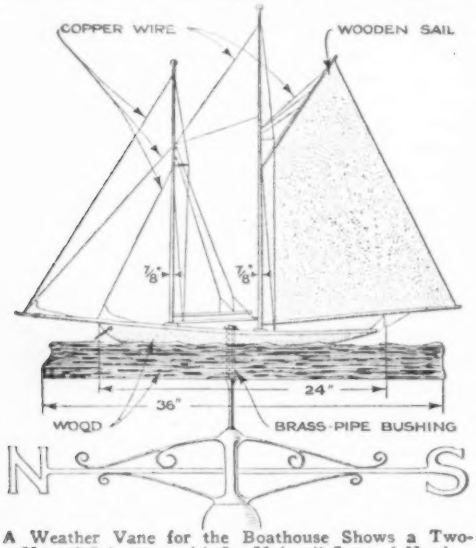
Another method of making molds, particularly applicable to designs with square caps or bases, or both, is shown in Figs. 19 to 22. A square base, of the same size as the bottom of the model, is first made, as shown in Fig. 19. Joggle holes, and a hole in the center for an iron reinforcing rod, are cut in this; when hard, it is then set up against the bottom of the model, which is laid on its side, and clay dams are built along the length of the model and base, the dams being shaped and placed as shown in Fig. 20. When the plaster for the first section has been poured and has hardened, the model is turned over, and the opposite side is treated in the same manner. Joggle holes are cut in the four exposed edges of the mold sections, the edges are shellacked and oiled, and the remaining sides poured. The form of two of the completed mold sections, the base, and reinforcing rod, are shown in Fig. 21, and the mold set up and in course of being filled in Fig. 22. When fastening the mold sections with wire, use L-shaped pieces of tin at the corners, to prevent the wire from cutting the mold.



The Various Steps in Making Molds from Models of Circular Section are Shown in this Illustration. Figs. 15 to 18 Show the Construction of a Mold for Pieces Having a Circular Section Throughout; Figs. 19 to 21, Making a Mold for Pieces Having Square Sections Incorporated in the Design, As, in This Instance, the Cap and Base. A Method of Fastening the Molds When Filling with Concrete is Also Shown

A Weather Vane for the Boathouse

A very attractive weather vane may be made in the form of a sailing vessel at anchor, with the mainsail set and headsails furled. Any type of vessel may be



A Weather Vane for the Boathouse Shows a Two-Masted Schooner, with Its Mainsail Set and Headsails Furled, Always Heading into the Wind

used, but a two-masted schooner makes, perhaps, the neatest appearance.

The hull, with the water and bowsprit, is made in one piece, from 1-in. board, pointing the bow to a thin edge and shaping the stern as much as the thickness of the material will permit. The masts may be made round, with flat sides to which the thin wooden sail is fastened with small galvanized brads, the booms being made in the same manner as the masts. A shoulder is made on the masts, about 2 in. from the lower end, making a step, about ⅝ in. in diameter, so that the sticks can be driven into a corresponding hole in the deck.

The sails are made of wood about ¼ in. thick, and copper wire is used for the rigging, while a piece of iron pipe is inserted in the middle to serve as a spindle bearing. The compass points and spindle, while they can be made, can better be bought through a hardware dealer.

The height of the building or flagpole should govern the size of the vane, but it is well to exaggerate the size of the spars and rigging a bit, or they will appear too small if the vane is elevated to a considerable distance. The mainsail will always keep the bow of the boat pointed into the wind.—J. Arthur Stevens, East Boothbay, Me.

Ferrotyping Glossy Prints

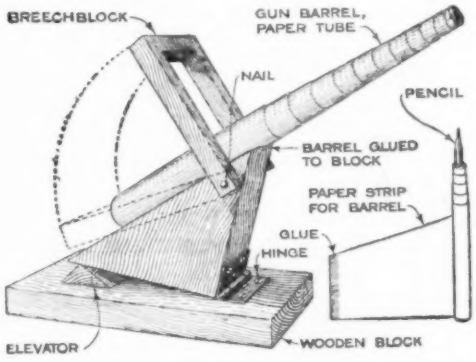
Glossy photographic prints can be made that will strip from the ferrotype plates much easier than usual, and they will also stand the ordinary method of mounting with starch or flour paste without any dulling of the glossy finish.

The method is simple, and consists in applying to the prints a solution composed of 1 oz. of formalin, the so-called "formaldehyde," to each 20 oz. of water. The prints are soaked in this solution for five minutes, washed in two or three changes of water, and ferrotyped in the usual way on enameled ferrotype plates.

A Breech-Loading Firecracker Cannon

A cannon for propelling firecrackers into the air, where they explode, can be easily made from a few pieces of wood and a paper tube. As the ordinary firecrackers are about the same diameter as a pencil, the 7 by 35-in. strip of tough paper, which is used to form the barrel, is wound around a lead pencil, and the ends are glued to prevent it from unwinding. When completed, the barrel is glued to a triangular block of wood, which is fastened to a 3 by 5½-in. wooden base with a hinge, as shown in the drawing. A smaller triangular block, under the rear of the larger one, permits control of the muzzle elevation by moving it back and forth. A U-shaped breechblock is attached to the mounting as shown.

Two firecrackers are required to fire the cannon. The fuse of one is cut short, and the cracker pushed into the breech of the gun, with the fuse toward the rear. The second firecracker is cut off at the end



A Toy Cannon from Which Firecrackers are Discharged to Explode in the Air: It Is Entirely Safe

opposite the fuse, just above the clay plug, and then shoved into the breech behind

the other, allowing its fuse to protrude over the breech block.

By lighting the exposed fuse, the charge in the cut firecracker is ignited, and because its end is not plugged, the force of the explosion drives out the whole firecracker and at the same time touches off the short fuse.—F. C. Brown, Brooklyn, N. Y.

Preventing Prints from Slipping

To prevent prints from slipping on a table, when they are being rubbed with an eraser, or other medium, for cleaning the surface, glue two sheets of fine sandpaper together, back to back. The prints are placed on the upper surface, and as there is a rough surface in contact both with the table and the print, there is little possibility of slipping.

A strip of fine sandpaper, or emery cloth, glued to the edge of the print trimmer, will also prevent prints from slipping after they have been lined up under the blade.

A Cement for Porcelain

A cement for mending porcelain or chinaware, and one that has excellent adhesive qualities when fresh, is made by adding 4 oz. of ordinary fish glue to 6 oz. of water glass, or sodium silicate, together with 1 oz. of precipitated chalk. The whole is rubbed into a thick paste.

The cement is used by applying a little to the edges of the broken parts; these are pressed together, and the cement allowed to dry in a warm place.

Utilizing Steel Trench Helmets

Steel trench helmets, which can be obtained at a very small cost in any of the so-called "army and navy stores" in the larger cities, when suitably decorated and mounted, form very attractive flower baskets or lamp shades. When used as flower baskets, three holes are punched, at equal distances apart, through the rim; chains are fastened through these holes, to support the helmet. The helmets may also be used on a simple wooden frame, as a flower stand, instead of a hanging basket.

In the lower illustration a helmet is shown transformed into a very attractive lamp shade. The decoration, while a matter of individual taste, may, if the maker is a former soldier, indicate the branch of the service to which he was attached.

Thus, instead of the flowered design of the photograph, the infantryman might use a running design of crossed rifles, with the rim painted light blue; the engineer, a design with a castle motif, the rim

Attractive Hanging Flower Baskets and Lamp Shades May be Made from Steel Trench Helmets. These Are Very Cheap, and Afford an Unlimited Opportunity for Individual Treatment in Decoration, Either by Painting or by Coloring the Steel Surface with Chemicals

being silver, and so on. A very agreeable finish is produced by first covering the helmet with a coat of gold-bronze paint, then stippling over with green and blue, thus producing an old-bronze effect that is attractive either alone or as a background for other decorations. The inside should be enameled white, to provide a reflecting surface.

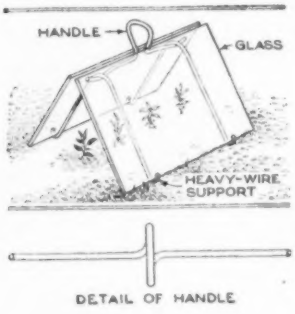
For those who have access to means for polishing the outer surface, it is suggested that they bronze the helmet by first polishing, then slightly heating it, covering the surface with a paste of antimony chloride, and allowing the helmet to stand until the desired shade of bronze appears. The paste may be made faster in action by adding a little nitric acid.

Another method of finishing is to immerse the helmet in a heated solution of 10 gr. antimony chloride, 10 gr. gallic acid, 400 gr. ferric chloride, and 5 fluid ounces water. The first color to appear is a pale blue; this passes through the darker blues o a purple, and finally to gray. The process may be stopped when any desired shade has appeared.

With these suggestions as a guide, anyone will be able to produce a very striking ornament, and one that, to the veteran, will have an added sentimental value.

A Plant Forcer

In order to force the growth of seedling vegetable plants, some means of retaining the sun's heat must be used, and for this purpose the device shown in the drawing will be found to give admirable results.



Two pieces of clear glass, which may be old photographic negatives that can be obtained for a cent or two each from any photographer, are inclined toward each other at the top, the glass plates being supported by a wire form.

Three pieces of stiff wire are required for the form, and these are bent as shown in the drawing, the top piece serving to lock the glass in place and also as a handle by means of which the whole arrangement can be easily moved.—Frank W. Harth, Bayside, L. I.

Opening Tight Containers

All have experienced the annoyance caused by ineffectual attempts to remove tight-fitting tops of containers. A simple trick, that will prevent many broken finger nails, or cut fingers, is shown in the illustration. Place a piece of strong string around the tin, just under the lid. Tie the ends, leaving about ½ in. of space between string and tin. Now insert a pencil, or other convenient instrument, under the string and twist as shown. The top can then be removed easily.—S. L. Bastin, Bournemouth, Eng.

Gas Saver for the Light Car

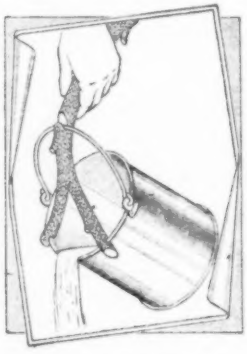
Owners of light automobiles can greatly increase their gasoline mileage by a simple contrivance that also permits considerably greater speed.

Drill and tap a 3/16-in. hole about the center of the intake manifold and screw in a small petcock, similar to those used on the crankcase. Next attach a rod to the handle of the petcock, and run the rod up through the dash, so that the cock can be adjusted while the car is running.

When the engine is started, the cock is closed, and allowed to remain closed until the engine has become thoroughly warmed up, when it is opened, giving additional speed and permitting the amount of gasoline to be cut down.—Carl Siderlund, Jr., Youngstown, Ohio.

Handling Camp Kettles

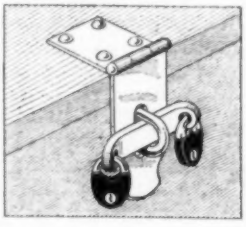
Removing a kettle from the camp fire demands considerable care and caution, if burned fingers are to be avoided and the contents of the kettle prevented from spilling and possibly extinguishing the fire.



Fortunately, there is usually a forked stick of the right size to be found somewhere near, and this is converted into a safe handle by cutting three notches in it, as indicated in the drawing, to prevent the handle and edge of the kettle from slipping. Using this handy little device, it is unnecessary to touch the handle until it is entirely cool, as the kettle can be removed from the fire and the contents poured out in the manner shown.—A. C. Cole, Chicago, Ill.

Lock Used by Two or More Persons

It often happens that several persons are to have access to a boat or locker protected by a padlock. If not enough keys for all are supplied with one lock, a simple way out of the difficulty, without the expense and trouble of having duplicate keys made, consists in using two padlocks, as shown in the drawing. A strap-iron link is made, with a hole drilled in each end to accommodate the padlocks; this is passed through the staple or a link of the boat chain, and locked at each end.



Ebonizing Oak

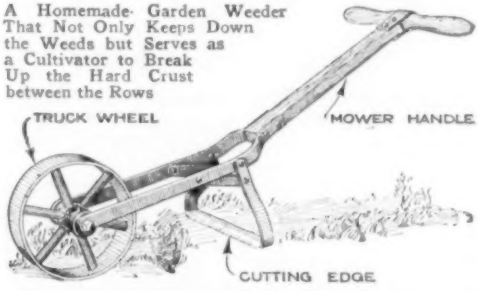
A good process for ebonizing oak is as follows: The wood is immersed for about 48 hours in a warm saturated solution of alum, and then sprinkled several times with a solution of logwood. This is prepared by boiling one part logwood in 10 parts water, filtering it through linen, and evaporating the liquid slowly until the volume is reduced by one-half. Add to every quart of this solution from 10 to 15 drops of a saturated solution of neutral soluble indigo.

After watering the blocks with this solution several times, rub them with a saturated and filtered solution of verdigris in warm concentrated acetic acid, until the desired depth of color is obtained.

A Homemade Garden Weeder

From a few pieces of flat iron, such as old buggy tires, and a wheel that can be taken from an old wheelbarrow or truck, it is possible to make an efficient weeder for keeping the home garden free from weeds.

The device is constructed, as indicated by the drawing, with a blade, parallel with the ground, which is pushed along just underneath the surface, cutting the roots of weeds and other plants outside the



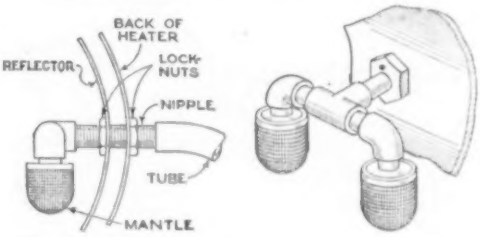
A Homemade Garden Weeder That Not Only Keeps Down the Weeds but Serves as a Cultivator to Break Up the Hard Crust between the Rows

rows. Not only will this instrument keep down the weeds, but it also acts as a cultivator by breaking up the hard crust between the rows and conserving the moisture for useful vegetation.—C. L. Meller, Fargo, N. D.

Converting Electric Heater to Gas

To reduce the expense of operating an electric heater, such as have become quite popular for tempering the chill of an early spring morning, the heating element was removed and replaced with two gas burners.

A hole was first drilled through the reflector and the back of the heater, and a short nipple secured in place with locknuts on each side, as shown in the drawing. A tee, equipped with two light fittings, was screwed on the front end of



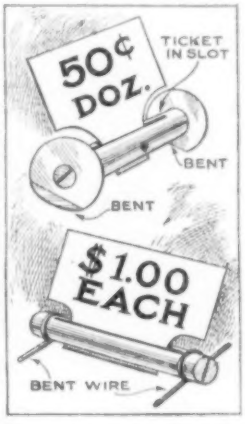
An Electric Reflector Heater Converted to the Use of Gas Removes the Chill of an Early Spring Morning from a Room, and the Cost of Operating is Considerably Reduced

the nipple, and the tubing connected to the other end; the light fittings were provided with mantles, and the heater was ready for use.

While this arrangement did not produce results quite so good as the electric heating element, it proved satisfactory and the operating cost was considerably reduced, which, in this case, was the important feature.—C. M. Vail, San Francisco, Calif.

Ticket Holders Made from Film Spools

Empty film spools, such as any photographer will cheerfully give away, can be used for making price-card and ticket holders, such as shown in the drawing.

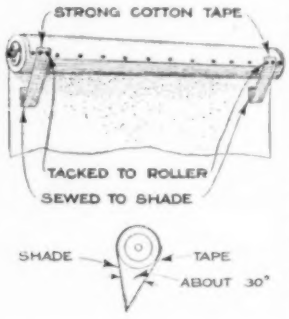


In the upper drawing, the ends of the spool are bent to form a flat surface and prevent rolling. Another method consists in removing the metal ends and wrapping a short piece of wire around each end of the core, which can be stained or finished as desired, the card being inserted through the slit provided for the film.—F. C. Davis, St. Joseph, Mo.

¶A small brush, fitted to the end of the handle of the fly swatter, will be found useful for brushing off insects that stick after having been killed.

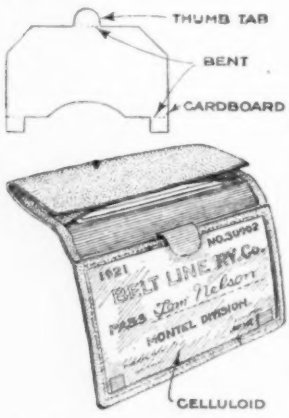
A Window-Shade Saving Device

In large buildings a great deal of expense is caused by window blinds or shades being pulled from their rollers, because there is no means of preventing them from being fully unwound. By attaching strips of strong cotton tape to the blinds and rollers, as shown in the drawing, the shade is prevented from being entirely unwound, and it requires a rather vicious yank to tear the tapes. The lower ends of the tapes are sewed to the shade and the upper ends are tacked to the rollers. On narrow shades, a tape at each edge will be sufficient, while several should be provided on very broad ones.—D. D. Gurnee, Hempstead, N. Y.



Protecting the Card Case

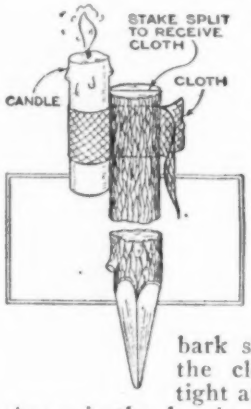
The transparent celluloid of the ordinary card case, containing identification cards and passes which must be frequently removed for examination of the reverse side, usually becomes torn loose at the upper edge within a short time. This is caused by the necessity of inserting the thumb and forefinger to withdraw the card, thus stretching and bending the celluloid.



The drawing shows a simple means by which the cards are easily removed and the celluloid protected against damage. A piece of thin, tough cardboard, the size of the card, is cut with a small tab at the top and two small projections at the bottom. It is a simple matter to slip any card into the case, but with the false back it is even easier to get it out. The small thumb tab is bent over against the cover and is easy to grip with the fingers; the projections at the bottom are bent up and the card resting upon them is withdrawn when the tab is pulled.—Frank W. Bentley, Jr., Missouri Valley, Ia.

A Handy Camp Candlestick

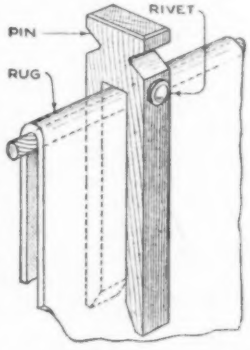
The lack of a candlestick, or other means for holding the candles commonly used to furnish the illumination in many camps, need cause no serious annoyance, as a suitable holder can easily be made from a strip of cloth, or bark, and a stake of suitable length.



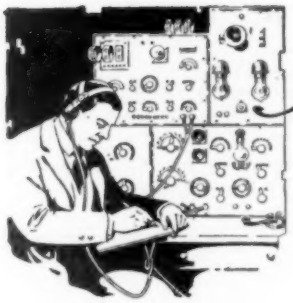
The upper end of the stake is split, and the ends of the cloth or bark strip are inserted in the cleft and pulled up tight around the candle, as shown in the drawing. The lower end of the stake is sharpened, so that it can be pushed or driven into the ground at any convenient location.

Rug and Carpet Clothespins

Anyone who has undertaken to fasten a rug or carpet to a clothesline knows that the ordinary clothespin is neither large enough nor strong enough for the purpose, the first blow of the beater usually serving to cause all the pins that can be squeezed on without splitting to fly off. The drawing shows a pin built for the special purpose of fastening the floor coverings to the line.



A piece of $\frac{5}{8}$-in. hardwood, about 6 in. long and $1\frac{1}{4}$ in. wide, has a slot, about $\frac{3}{8}$ in. wide, cut down the center. To prevent the pin from splitting, a long rivet is inserted through a drilled hole just under the head, and riveted over a washer.



A SPACE-SAVING RECEIVING TUNER

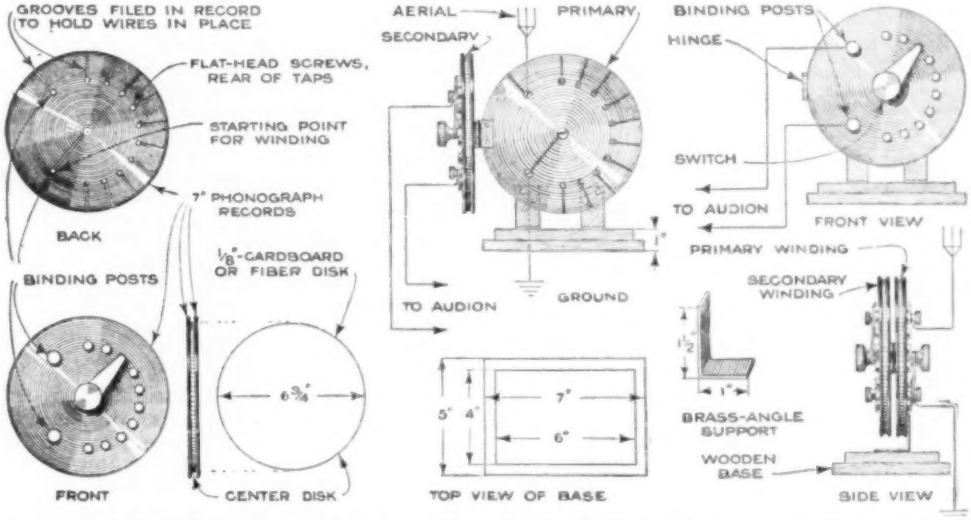
By F. L. Brittin

THE type of radio-receiving tuner described in this article occupies less space than other designs of like capacity, is easy to make and simple to operate, works well on loop aerials and has proved highly efficient when used in connection with the vacuum-tube Marconi bulb.

The coupling between the primary and secondary windings is adjusted by pulling the secondary out at right angles; this does not involve the telescoping of primary and secondary as found in the variometer, but the result is the same.

Such an inexpensive and compact tuner lends itself admirably to portable sets, where simplicity and compactness are highly desirable. The primary and secondary disks are both identical, with the exception that four extra holes are drilled in the primary disk for the brass angle supports. The disks, which are made of 7-in. phonograph records and cardboard, are easy to construct, but care must be used in drilling to avoid cracking. Two records are required for the primary disk, and two for the secondary. The center disks are cut from fiber, or heavy cardboard, and well shellacked. Next, glue the records to the center disks and clamp through the center to hold them in position until dry. After the glue has dried, the disks are drilled, notched, and grooved. The central holes for the switch levers will be ¼ in. in diameter, and are already provided in the records. The holes for the binding posts and taps are drilled to correspond with the material the builder has on hand. Mount all taps, binding posts, and switch levers complete, and wind the primary with 110 turns of No. 28 double silk-covered magnet wire, starting at the point indicated in the drawing and bringing out taps every 11 turns. When each tap is reached, loop the wire; twist, and bring it over the notch in the edge of the disk to the tap, where the insulation is removed and the wire soldered to the back of the tap, taking care not to melt the disk while soldering.

The secondary disk is wound with 210 turns of No. 32 double silk-covered magnet wire, with the taps brought out every 21 turns, starting and completing the disk as described for the primary. The switch



A Simple and Easily Constructed Receiving Tuner That will Take Up Very Little Space on the Operator's Table: The Materials Used Are Easy to Obtain, the Winding and Assembly Are Very Simple, and the Tuner will be Found to Operate Well on a Loop-Aerial Circuit

levers on both primary and secondary disks are connected to the binding posts, as indicated in the various drawings.

After all connections have been soldered, file off all long screw ends, and cover with bookbinder's cloth. The small brass hinge used to connect the two disks can be obtained at any hardware store, as well as the two small brass angles which support the primary on the base. Phonograph needles may be driven into small holes beside the first and last contact points as stops for the switch lever. The switch-lever blade is made of No. 28 gauge spring brass, the knobs, contact points, etc., being obtained at any supply house.

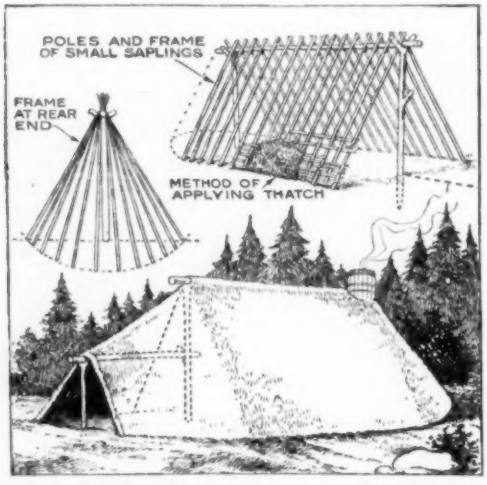
The base may be made of well-sanded oak, walnut, maple, or other hardwood, stained and finished as desired.

MATERIAL LIST

4	binding posts	1	small brass hinge
2	switch levers complete	2	brass angles
20	contact points	2	pieces hardwood (base)
4	7-in. phonograph records	200	ft. No. 28 d.s.-c. magnet wire
2	cardboard or fiber disks	400	ft. No. 32 d.s.-c. magnet wire

A Cave House of Boughs and Thatch

There is a singular romance attaching to cave dwellers, or troglodytes, that never ceases to fascinate a boy, possibly



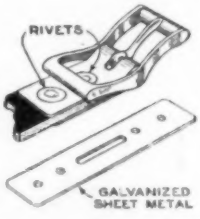
There Is a Singular Fascination to Boys in Living in Caves, but It Is Dangerous. This Cave House can be Built Anywhere and Is a Perfectly Safe "Robbers'" Den

for the reason that pirates, and other characters of his favorite fiction, hold forth and store their booty in caves. Cave houses are dangerous, as the earth is likely to cave in on the workers, but the house described in this article offers an acceptable substitute.

Two forked sticks are securely set into the ground, and a ridgepole is laid across the forks, as shown. The sides are formed by placing a number of small poles, or saplings, at an angle to the ridgepole. Additional strength is obtained by burying the bottom ends of the poles in the ground. A number of poles are arranged in a semicircle at the rear of the frame, the poles resting in the crotch of the rear upright and ridgepole. The house is completed by covering it with boughs, thatch, bark, or sod. If thatch is used, it is necessary to have some poles nailed or tied horizontally to the frame, or smaller boughs may be woven between the side poles, basket-fashion. Begin applying the thatch at the bottom and work toward the top. When the bottom row of thatch has been applied, another row is put on so that the rows overlap, until the top is reached. A hole is left at one end in the roof, to permit escape of smoke from the fire which is built directly underneath. If the front upright has a crotch about the center, a small extension may be added to the house, built in the same manner as the house itself, so that the young "pirates" and "smugglers" will have to crawl into their dwelling after the approved fashion.—J. G. Allshouse, Avonmore, Pa.

Attaching Buckle to Broken Strap

When repairing harness, leather straps are often found to be badly worn where they are looped through buckles. To turn a fresh loop shortens the strap, and to rivet another length of leather to the end, makes a bulky, unserviceable repair.



A much neater method is to cut a piece of galvanized iron to the shape shown in the drawing, slip the tongue of the buckle through the slot, bend the iron over the end of the strap, and rivet. The galvanized iron will not wear out as quickly as the leather, and it will not rust from the sweat of the horse.—Geo. McVicker, North Bend, Neb.

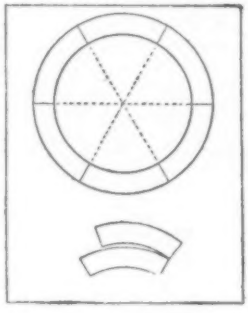
¶Small rubber rollers can be made by drawing rubber strips through a hole in a heated piece of metal.

The Care of Tire Chains

The statement that more tire chains rust out than are worn out contains more than a grain of truth. To prevent the chains from rusting they should be oiled. Fresh oil is not required; that which is drawn from the engine at intervals will answer very well. Have a can of this old oil where the chains can be dipped conveniently, and, after dipping, hang them on a nail overnight to drain off the surplus. This treatment leaves the chains ready to be wrapped in a cloth and placed in the tool box, and is, perhaps, best appreciated when it comes to applying them to the tires, as the hooks will not require the usual amount of twisting and hammering to fasten them.

A Simple Geometrical Trick

A simple geometrical trick that can be made from a piece of cardboard will provide plenty of entertainment at the efforts of others to prove that two identical circular-ring sectors are of different sizes.



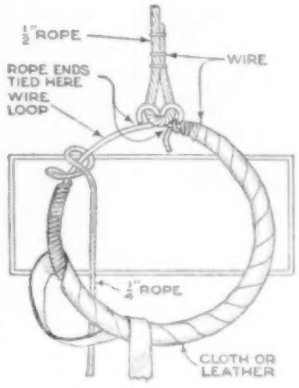
Two concentric circles are drawn on the cardboard with a compass, and these are carefully divided into six equal parts, and two ring sectors are cut out. Then place the sectors one above the other as below and ask someone how much longer one piece is than the other. Unless the person has seen the experiment before, he will invariably say that one is considerably longer than the other. Now reverse the pieces and repeat the question. The fact that the two pieces are the same size can be established to the satisfaction of anyone by placing one on top of the other.—Norman Hazen, Montreal, Que.

Stopping Leaks in Wooden Tanks

It is often difficult to drain wooden tanks to repair leaks. One method of stopping a leak is to put some oatmeal in a paper bag, then tie this on a stick and push it down against the leak. With another stick, rip the bag slightly, and enough oatmeal will be drawn into the leak to stop it.

Cheap Gymnasium Rings

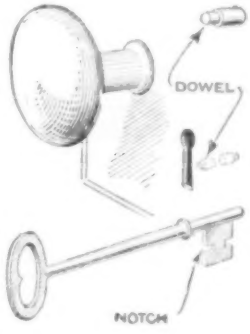
An inexpensive pair of gymnasium rings can be made from heavy wire, iron rod, or even the heavy bails, or handles, of some types of buckets, if they are not required to carry too much of a load.



The ends of the wire or rod are bent into eyes, and after the ring has been formed, it is wound with rope to make a comfortable grip for the hands. The rope may be covered with a strip of strong cloth, or an even better effect obtained with a strip of leather. The rings are suspended from a suitable rope passed through the eyes and secured as shown in the drawing.—C. Alvarado Frouard, San José, Costa Rica.

Making a Lock More Secure

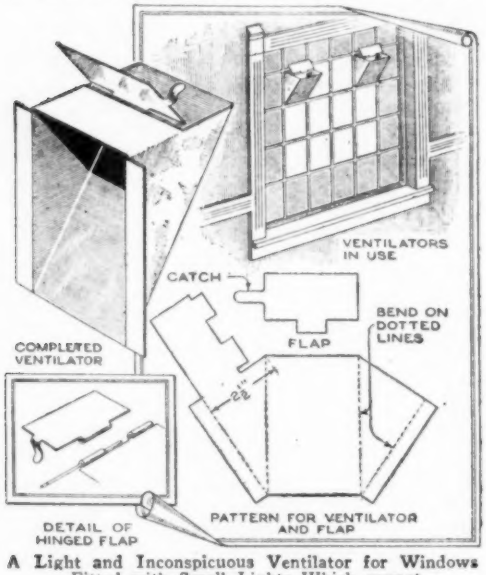
There are many varieties of cheap door locks that can be opened with almost any kind of a key, but these can be arranged so that none but the proper key can even be turned in the lock. This method consists in removing the lock plate and drilling a small hole at one side of the key opening, and then riveting a small metal dowel pin in place; the dowel will prevent any key but the right one from being turned in the lock.



In order to make the key fit the lock that has thus been altered, an additional notch must be filed in the key to pass over the pin, the notch being filed on both sides of the key so that it can be inserted and turned from either side of the door to lock or unlock it. If desired, the lock can be arranged to be unlocked from only one side by filing the notch on one side of the key only, and also two dowels may be used.

Ventilators for Small-Light Windows

Windows with many small lights are quite frequently mounted so that it is impossible to raise or swing them open to afford ventilation, and it is for windows



A Light and Inconspicuous Ventilator for Windows Fitted with Small Lights Which cannot be Opened for Ventilation

of this type that the ventilator shown in the drawing is designed.

The ventilators are made of galvanized sheet steel, in accordance with the pattern shown, the sides being bent as shown by the dotted lines. The height of the sides should be exactly the same as that of the glass the ventilator is to be substituted for, and the sides, for neatness' sake, should not be more than 2½ in. long, as indicated in the pattern, although the length of the sides is shown, in the illustration, a little exaggerated for the sake of clearness.

If the ventilators are to be applied to leaded-glass windows, they may be attached permanently by soldering to the lead strips, care being taken to prevent cracking the glass; while in windows with wooden frames, they are puttied in place in exactly the same manner as the glass. A small catch, formed on the flap, and bent to bear against the side of the ventilator, while not absolutely essential, will prevent the flap from chattering in strong winds.

¶ Melted sealing wax over the connections of a radio aerial switch will prevent corrosion and leakage over the base in wet weather.

Frosting Glass

To frost glass, rub it with a piece of marble, using emery powder as the abrading agent. Coarse powder should be used first, following with finer as the surface becomes finished.

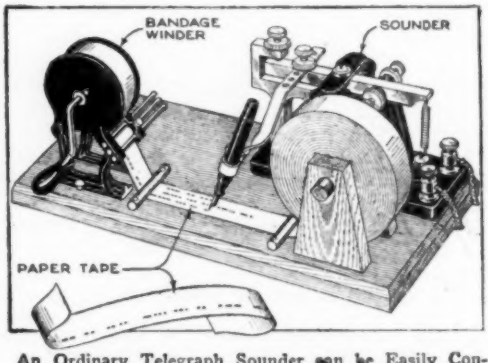
For temporary frosted effects, the simplest method consists in dabbing on the glass a mixture composed of a saturated solution of Epsom salts, to which a little gum arabic has been added. The solution should be applied warm, and, if the glass is to be handled much, it should be given a coating of gum water.

A Printing Telegraph Instrument

As every amateur telegrapher knows, it is much easier to send messages than it is to receive them from another station. To provide a means for printing the messages on paper tape, almost any type of sounder can be converted into an improvised printing telegraph instrument without alteration.

The armature setscrew is removed and, in the original instrument, a strip from a "model builder" set is inserted underneath it. The metal strip is bent into the shape shown, with a clip at the outer end, through which a fountain pen is inserted and tightly fastened with a small wooden wedge. The paper tape, which is the kind used on most types of adding machines, passes under the strips to the winding apparatus, made of a bandage roller.

The pen is adjusted so that, when the armature is drawn down by the magnets, the pen will come into contact with the moving paper, making a short line for a



An Ordinary Telegraph Sounder can be Easily Converted into a Simple Printing Telegraph Instrument without Altering the Sounder

dot and a proportionately longer one for a dash, the winder being turned so that the tape passes under the pen at a constant speed.—W. G. Dewar, Ottawa, Ont.

OPPORTUNE ANNOUNCEMENTS

Whenever prize competitions mentioned on this page are conducted by a public institution, the name and address will appear with the announcement. Industrial addresses will not be published, but may be obtained from our Bureau of Information by request, mentioning the title of the article and date of publication.—Editor.

ENGINEERS, SURVEYORS, AND DRAFTSMEN WANTED IN U. S. CIVIL SERVICE

The Civil Service Commission announces open competitive examinations for the following positions in the Reclamation Service: irrigation, or civil engineer, $2,400 or over a year; assistant irrigation, or civil engineer, $1,500 to $2,280 a year; junior irrigation, or civil engineer, $1,200 to $1,440 a year, and engineering draftsman, $1,200 to $2,400 a year. The entrance salary within the range stated will depend upon the qualifications of the appointee as shown in the examination, and the duty to which assigned. Appointees may be allowed the increase granted by congress of $20 a month. Applications for these examinations will be received by the commission at Washington, D. C., until Aug. 1, 1921, unless sufficient eligibles are obtained before that date, of which due notice will be given.

The Civil Service Commission also announces examinations to be held on July 6 and 7 to fill a number of existing vacancies in positions of junior engineer and deck officer U. S. Coast and Geodetic Survey, entrance salary $2,000 a year, to be increased to $2,240 after one month of satisfactory service. The examinations cover mathematics, astronomy, modern languages, physics, and surveying.

Full information and application blanks may be obtained by communicating with the U. S. Civil Service Commission, Washington, D. C.

SECOND ANNUAL PULITZER AIR RACE AND OTHER AIRPLANE CONTESTS

The Aviation Country Club of Detroit announces the second annual aerial contest for the Pulitzer trophy, in conjunction with the first contests open to all types of airplanes for other trophies, and also $10,000 in prizes. The contests are to be conducted at Selfridge Field, Mt. Clemens, Mich., Sept. 8, 9, and 10, 1921. The first on the 8th will be for the Detroit News aerial-mail trophy, open to large-capacity, multimotored airplanes; the second, on the same day, will be for the Aviation Country Club of Detroit trophy, open to light commercial airplanes; and the third, on the 9th, will be for the Liberty-engine builders' trophy, open to observation-type, two-passenger airplanes. These races will be four times around a closed course of approximately 66 miles, and besides the trophies there will be a first prize of $1,500, a second of $750, and a third of $250. On the 10th, will be held the Pulitzer race for high-speed airplanes, recognized as an international classic of the air. This race will be four times around a triangular course of 40 miles, so as to conform to the conditions of the Gordon-Bennett race.

ESSAY CONTEST ON GOOD ROADS OPEN TO HIGH-SCHOOL STUDENTS

As a means of stimulating interest in problems of highway construction and use, an essay contest on the subject "Good Roads and Highway Transport" has been announced by the Highway and Highway-Transport Education Committee, Washington, D. C. The contest is open to all pupils of high-school grade, and the prize is a four-years' university scholarship. Essays must not exceed 500 words in length, and must be in the hands of local committees not later than June 15, when the contest closes. High-school principals can furnish all information to students interested in this contest.

U. S. SCULPTORS INVITED TO COMPETE FOR MONUMENT IN MONTEVIDEO

What the cowboy is to the United States, the French habitant to Canada, the "gaucho" is to South America—that and more, for relatively he has had a far greater influence on the development of his native state. The government of Uruguay, for this reason, proposes to erect in the city of Montevideo a monument to commemorate his services to the state. The principal figure is to be a statue of the gaucho, and sculptors from the United States are invited to submit designs in the form of a plaster cast about 4 ft. high, with details on a larger scale, a sketch in colors, and a written description of the work. The monument must suit an expenditure of not more than $62,000, including the artist's remuneration. The time limit for entering the casts expires July 15, 1921. Full information can be obtained by applying to the Pan-American Union, Washington, D. C.

PRIZE IS OFFERED FOR BEST MUSICAL SETTING OF POEM "THE FOUR WINDS"

A prize of $100 is offered for the best musical setting of the poem "The Four Winds," by Chas. H. Luders. The principal conditions of the competition are, that the composer must be a resident of the United States; the setting must be for chorus of men's voices with piano accompaniment, and the composition must sing well within a reasonable vocal compass. Competing compositions must be mailed to D. A. Clippinger, 617 Kimball Bldg., Chicago, Ill., on or before July 1, 1921.

PRIZE FOR PIANO-AND-STRINGS QUINTET BY AN AMERICAN COMPOSER

Mana-Zucca, founder and president of the society of American Music Optimists, personally offers a prize of $500 for the best musical composition for a quintet (piano and strings) written by an American composer. The contest will close on Nov. 1, 1921. Manuscripts must be labeled with a motto, or nom de plume, which must be repeated on an accompanying envelope inclosing the name and address of the composer. These envelopes will not be opened until the winning composition has been selected. Manuscripts are to be addressed to M. Gobert, 4 West 130th St., New York City.

PRIZE OF $500 AWARDED NAVY CLERK FOR AN ECONOMICAL SUGGESTION

Before leaving the Navy Department, Secretary Daniels approved an award of $500 to John W. Kean, the civilian in charge of the passenger-transportation section of the Bureau of Navigation. The award was in recognition of the value of a suggestion made by Kean, in 1913, for a plan of subsisting large drafts of men from its own stores, while traveling by rail. This had been done previously by the purchase of meals from dining cars, or restaurants along the road. The first draft fed under Kean's system was from Great Lakes to Bremerton, Wash., and the plan proved to be so successful that the commanding officer at Great Lakes very highly commended it to Secretary Daniels. Since then, 225 drafts of men have been subsisted by the navy in accordance with this plan.

CONTESTS PREVIOUSLY ANNOUNCED

Students of Railroad Engineering: Scholarships; announced March, 1920; closes Dec. 31; offered by the Southern Pacific.

Essays on Life of Roosevelt: Scholarship prizes valued at $1,000, $750, and $500; announced Aug., 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

New Methods of Testing Hardness of Metals: Prize $1,000; announced Oct., 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

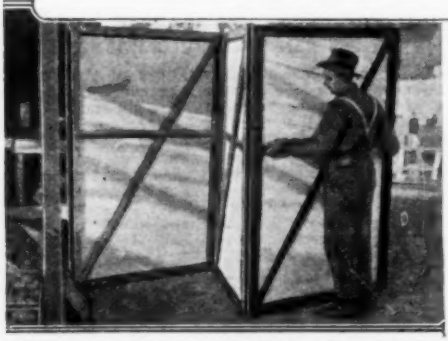
Nonskid Horseshoe: Prize, $1,030; announced April, 1921; closes July 1; address, American Humane Association, W. O. Stillman, president, 287 State St., Albany, N. Y.

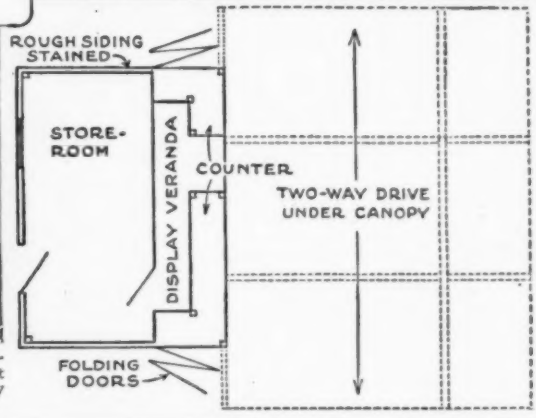
Painless Animal Trap: Prize, $500; announced, May, 1921; closes Oct. 1; address, American Society for the Prevention of Cruelty to Animals, New York City.

Essays on Economics: Prizes, $1,000 and $500; announced June, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

ROADSIDE BUSINESS STANDS ERECTED AT SMALL COST

General View of a Roadside Business Booth with a Canopy Extending over a Driveway in Front of It





Above Is a Close-Up of the Folding Doors for Inclosing the Open Veranda at Night. On the Right Is a Plan of the Whole Structure with Explanatory Notations

THE combination of business with pleasure is made easy for city dwellers, touring by automobile on country roads, by the erection on the roadside of booths for selling farm and garden goods by the producer directly to the consumer. An attractive and practical kind of structure of this kind is shown above, situated on a roadside in southern California. The selling booth, 16 by 18 ft. in dimensions, is back some distance from the curb, leaving space for an ample display veranda, and for a driveway so that cars can stop for business at the booth without impeding traffic on the road. Over this driveway a light canopy, 20 by 26 ft., can be erected to provide shelter, but this is regarded as optional. It consists of wooden posts carrying overhead a framework of two-by-fours, covered with laths spaced 1 in. apart, all stained green. The walls of the booth are rough wooden siding, stained dark brown, with one window and a door at the rear, and the roof is of similar material covered with tar paper or any waterproof material. The display veranda is inclosed at night by means of folding doors, each composed of three leaves made of wooden frames over which canvas is stretched tightly, backed by heavy chicken wire. At southern California prices, the entire cost of this roadside stand, exclusive of the canopy, is $100, and the latter can be erected for an additional cost of about $25, if considered desirable.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]